Heating Piping & Air Conditioning

AUGUST 1957

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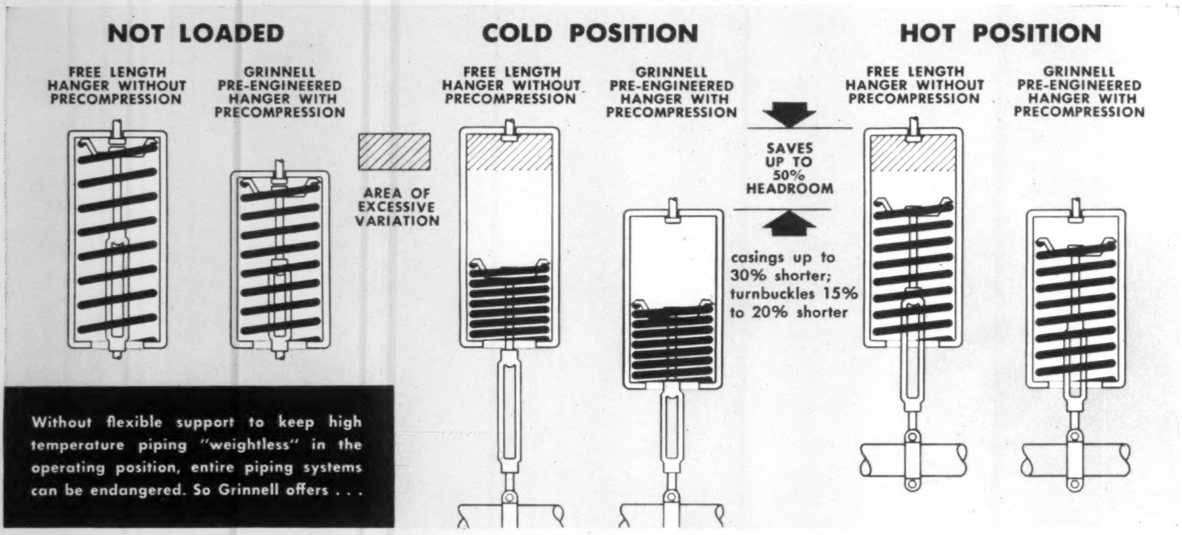

NOT LOADED
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION
AREA OF EXCESSIVE VARIATION
COLD POSITION
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION
SAVES UP TO 50% HEADROOM
casings up to 30% shorter; turnbuckles 15% to 20% shorter
HOT POSITION
FREE LENGTH HANGER WITHOUT PRECOMPRESSION
GRINNELL PRE-ENGINEERED HANGER WITH PRECOMPRESSION

Without flexible support to keep high temperature piping "weightless" in the operating position, entire piping systems can be endangered. So Grinnell offers . . .

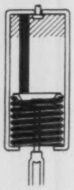
Precompressed Hangers for Safer Support of Piping

Helical coil springs are widely used in hangers for flexible support of piping which moves up or down during thermal expansion. The A.S.A. code for pressure piping requires that variable spring hangers support at least a minimum of 75% of the pipe's weight for a pipe that rises (relaxing the spring) and no more than 125% of the pipe's weight for a pipe that lowers (compressing the spring) during operation.

Precompression patented Grinnell principle

To guard against the spring's supporting force exceeding the limits of variation, Grinnell developed and patented a variable spring hanger design. The steel casing holds the spring permanently precompressed, at the threshold of the hanger's working load range. This prevents the spring decompressing into its area of excessive variation.

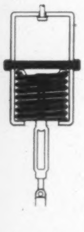
Pre-set is not a substitute



As a partial substitute for this patented precompression, some manufacturers insert a spacer between the top end of a free-length hanger casing and the spring to hold the spring's height temporarily within the working range during shipment and erection.

Another device requires the manufacturer to drill symmetrically opposite holes in the casing walls and insert a bolt to hold the spring's height within the working range. When these devices are removed from the hanger and discarded, the spring can decompress, resulting in high variability in supporting force.

Cold-setting a universal factory service



For the erection crew to avoid having to compress the spring down to the erected position, the manufacturer can compress the spring down to this height. Grinnell can provide a cold-set bolt in precompressed hangers.

Less headroom required by Grinnell Hangers

Shorter hanger casings made possible by Grinnell's patented precompression, reduce bulk shipping weight and required headroom by eliminating undesirable height. Installation is simplified by this shorter casing and also by an integral load scale with load indicator.

Additional headroom is saved by a correspondingly shorter turnbuckle. These precompression advantages are available in short spring and double spring models as well as standard spring models.

Refinery piping supported safely, with ample flexibility but low headroom.

Available in 63 standard units

Grinnell Variable Spring Hangers are available in 21 sizes each of short, standard and double spring models . . . for maximum travel of 1¼, 2½ and 5 inches respectively within working load ranges. Load capacities extend from 43 lbs to 30,550 lbs. The maximum variation in the standard size per ½-inch deflection is 10½% of rated capacity; inversely proportional in short spring and double spring models.

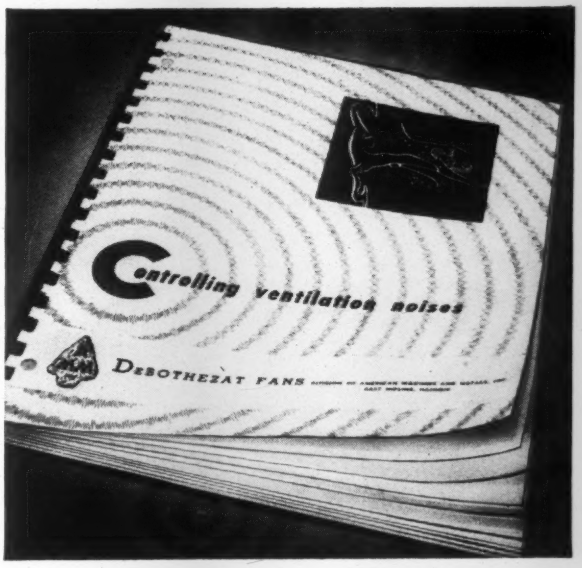
For further information

If you have a pipe suspension problem, you are invited to write: — Grinnell Company, Inc., 272 West Exchange Street, Providence, R. I.

At last, authoritative research shows the way to

Predict and Reduce Fan Noise!

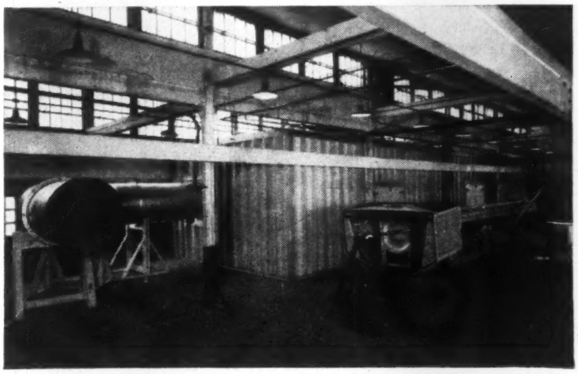
DeBothezat now offers this new 50 page book on noise control . . . anyone can use it to predict and reduce ventilating fan noise in every installation.



You need this new book, "Controlling Ventilation Noises," if you ever have *anything* to do with specifying or installing fans. This book simplifies the unfamiliar, specialized terminology of the acoustical engineer — as well as the methods for solving noise problems — so that the entire data can be put to practical use in the plant. It covers installations indoors as well as outdoors.

This data is entirely new. Nothing like it has ever before been available to the industry. The book is a result of noise control research recently completed by the acoustics staff of the Armour Research Foundation of Illinois Institute of Technology.

DeBothezat Centrifugal Roof Ventilator undergoing standard noise source calibration tests at Armour Research Foundation's acoustical laboratories.



Exterior view air outlet end of DeBothezat noise evaluation reverberation test rooms. Mock-up engine cooling test equipment in the foreground.

To supplement the research performed at Armour Research Foundation, which was sponsored by the DeBothezat Fans Division, DeBothezat has constructed its own noise-evaluation laboratories. These include reverberation rooms designed and calibrated for DeBothezat by Armour.

The entire noise evaluation project was sponsored by DeBothezat as a contribution to industry. It was accomplished at a cost of over $20,000 including the research at Armour and the facilities installed in DeBothezat's laboratories.

DeBothezat's facilities are now being used (1) to *obtain* accurate sound-output data on fan units, (2) to *develop* new fans with lower noise levels, and (3) to allow *publishing* of reliable sound-output data. In fact, DeBothezat fans are now rated for noise on both the inlet and outlet sides. These ratings are expressed in decibels and give the average sound pressure levels in each of 8 octave bands of frequencies, measured separately. This information is available on *all* DeBothezat fan units. They are the only fan units in the industry so rated.

The helpful 50-page book "Controlling Ventilation Noises," is available for just $2.00 prepaid to help defray costs of printing and handling. With it, anyone can predict and reduce ventilating fan noise in every installation. Request your copy on your business letterhead and attach check or two one-dollar bills.

De Bothezat FANS
A DIVISION OF
American Machine and Metals, Inc.
Dept. HP-857, EAST MOLINE, ILLINOIS

IN CANADA: Represented by DOUGLAS ENGINEERING CO., Ltd., Toronto • Montreal

45 years of repair-free service lands repeat order for Wrought Iron Pipe

The Rike-Kumler Co., Dayton, Ohio
Architects: Lorenz & Williams
Consulting Mechanical Engineers: Schweiger, Heapy & Associates
Contractor: H. J. Osterfeld
Dayton, Ohio

Engineers found plenty of support for the use of wrought iron pipe in The Rike-Kumler Company's new store addition . . . and they found it right next door in the Company's original building.

Wrought iron pipe was specified in 1911 for the entire heating system piping of this structure. It has served all these years without one bit of trouble. Such a performance called for more of the same, so wrought iron was used again in the new 12-story addition for the heating system, hot and cold water lines, and air conditioning piping.

Wrought iron had a strong vote from the store's chief plumber, too. He commented that it was easier to cut into wrought iron pipe than other materials when running off branch lines. And, the wrought iron pipe systems never gave him any "pulling apart at the joints" trouble.

Our booklet, "Piping for Permanence," presents wrought iron pipe's case against corrosion. Write for a copy.

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ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 29 No. 8

(With which is merged the Aerologist)

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Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America, $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 60c each. January 1957 issue $1.50 per copy. For change of address, notify publisher and your local postoffice of both old and new addresses by the 8th of the preceding month. Member Audit Bureau of Circulations, Associated Business Publications, Inc., and Magazine Publishers Association, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc., and Industrial Arts Index and is microfilmed by University Microfilms. ©1957 by the Keeney Publishing Co. Entered as Second Class Matter May 18, 1929, at the Post Office at Chicago, Ill. U.S.A. under the Act of March 3, 1879. Additional entry at Mendota, Ill.

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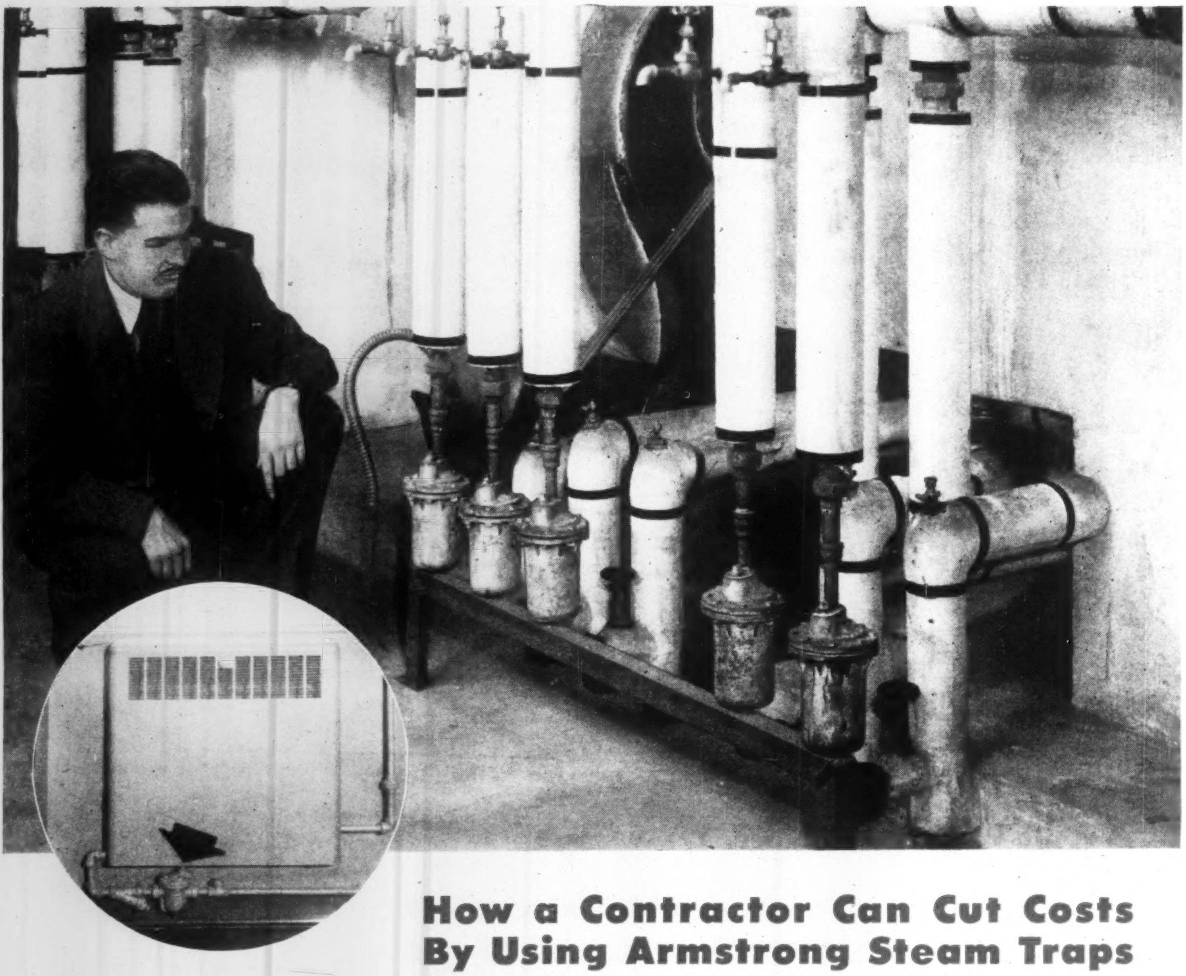


How a Contractor Can Cut Costs By Using Armstrong Steam Traps

● There is more than meets the eye in steam traps. If you don't regularly specify Armstrongs, you ought to know about these cost factors:

1. First Cost. The size and, hence, price of a trap is determined by its capacity. The high capacity of each Armstrong trap often enables you to select a size smaller than you would otherwise use.

2. Installation Cost.

Connections. Armstrong offers you a choice of straight-through horizontal or vertical connections, as well as a right angle trap, to save fittings and labor.

Strainers—seldom needed because ordinary dirt and scale won't plug up an Armstrong. When strainers are desirable, Armstrong offers built-in strainer traps that cost less to buy and install than separate traps and strainers.

Check Valves. Here again, Armstrong offers a cost saving with a stainless steel, spring loaded internal check valve that is superior to external check valves.

3. Call-Back Cost. When you put in Armstrong traps, the job is done. The traps will work without attention, not just for a month or two or even a year, but *more commonly 3 or 4 or 5 years!* No traps have so enviable a record for low maintenance as Armstrongs because the mechanisms in low pressure traps are identical in design, workmanship and materials to those used in traps for 900 lbs. pressure, 900°F temperature.

Get the figures and the facts. Call your local factory-trained Armstrong Representative or write:

ARMSTRONG MACHINE WORKS
8748 Maple Street,
Three Rivers, Michigan

How to Select and Install Steam Traps for Lowest Cost:

Here are two pieces of useful literature you should have—free on request:

1. Armstrong Steam Trap Book— 44 pages of trap data, tables, hookup diagrams and selection information.

2. Unit Heater Trapping—trap selection and installation plus BTU output tables for every model of 30 makes of unit heaters.

ARMSTRONG

UNCONDITIONALLY GUARANTEED TO SATISFY THE USER

APPLICATION ENGINEERED

STEAM TRAPS

If you're filtering baseballs this filter will meet all needs

...but air filtering isn't so simple!

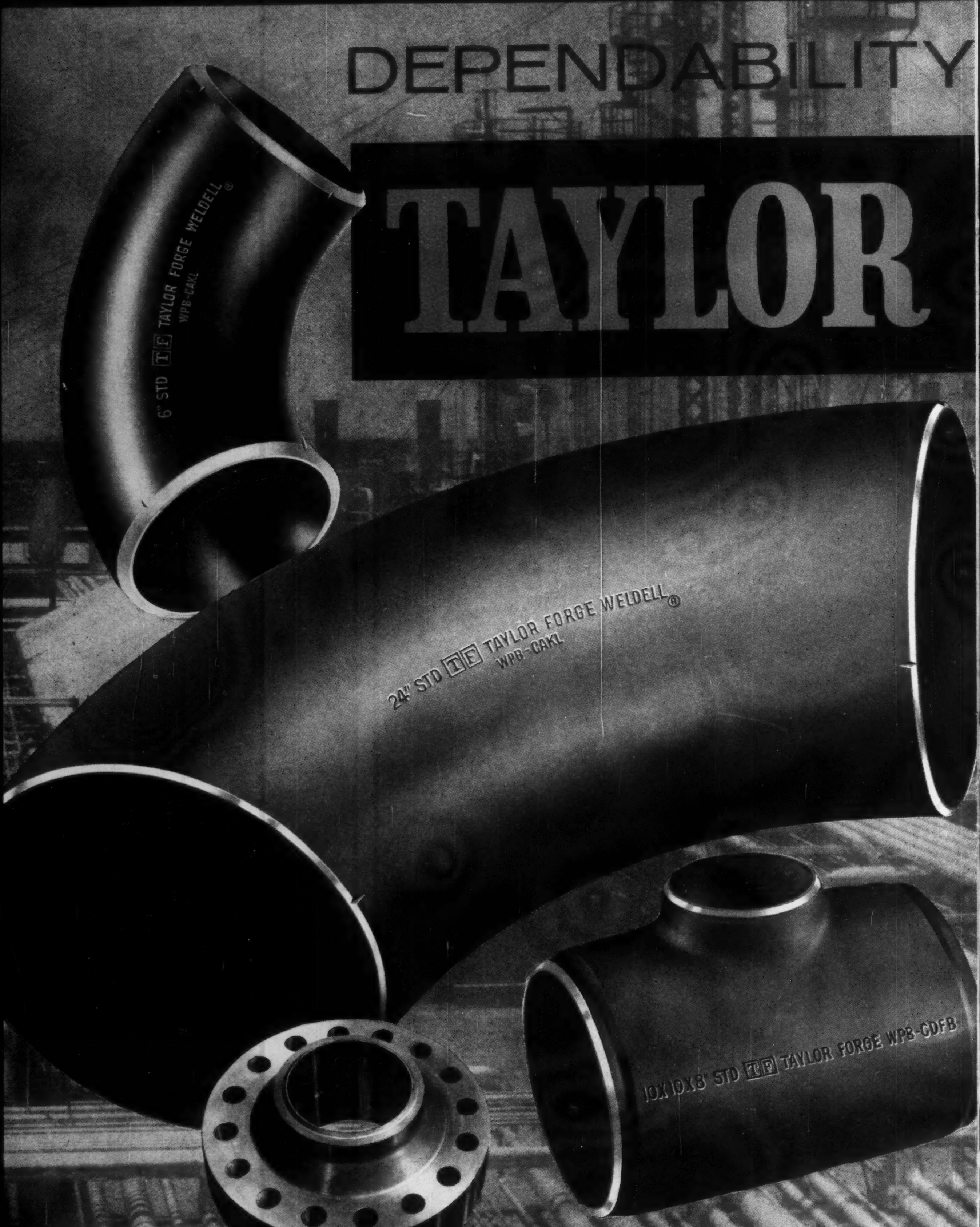
When you come right down to it, a catcher's mask is a filter. Unlike air filters, the masks can be standardized because the game is standardized. *Clean air needs of business and industry are not!*

Different requirements call for different filters. No matter how diverse these requirements are, the air filter *must* do the cleaning job, without interfering with the maintenance program. *There is no one type of air filter that can do it.*

AAF—and only AAF—makes *all kinds* of filters with *all kinds* of maintenance characteristics. Result: the *right* filter installation for you.

AAF herman nelson

American Air Filter
COMPANY, INC.
373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.


DEPENDABILITY
TAYLOR
6" STD TF TAYLOR FORGE WELDELL®
WPB-CAKL
24" STD TF TAYLOR FORGE WELDELL®
WPB-CAKL
10X10X8" STD TF TAYLOR FORGE WPB-CDFB
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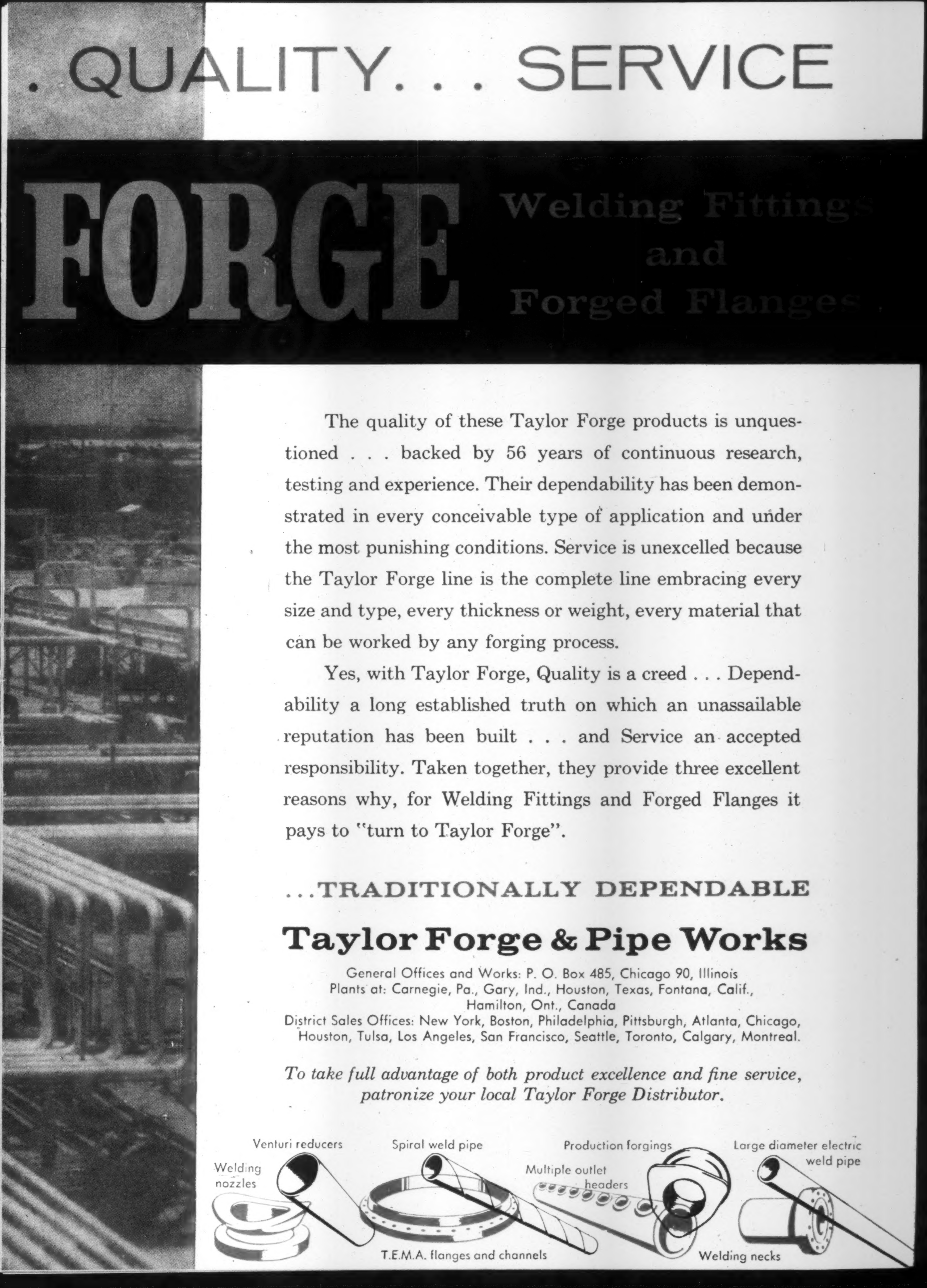

. . QUALITY. . . SERVICE

FORGE Welding Fittings and Forged Flanges

The quality of these Taylor Forge products is unquestioned . . . backed by 56 years of continuous research, testing and experience. Their dependability has been demonstrated in every conceivable type of application and under the most punishing conditions. Service is unexcelled because the Taylor Forge line is the complete line embracing every size and type, every thickness or weight, every material that can be worked by any forging process.

Yes, with Taylor Forge, Quality is a creed . . . Dependability a long established truth on which an unassailable reputation has been built . . . and Service an accepted responsibility. Taken together, they provide three excellent reasons why, for Welding Fittings and Forged Flanges it pays to "turn to Taylor Forge".

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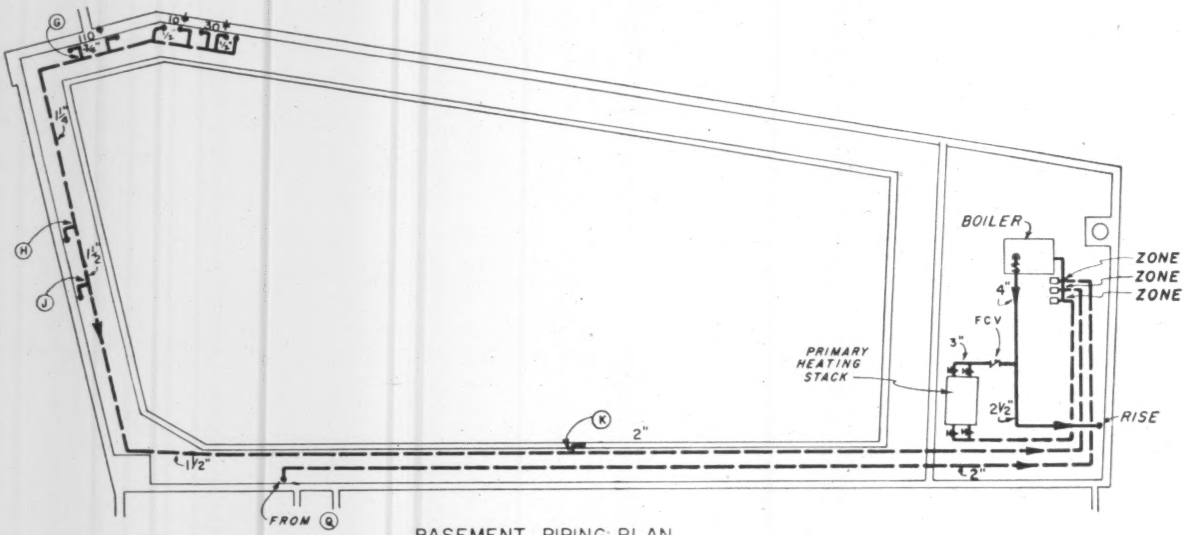
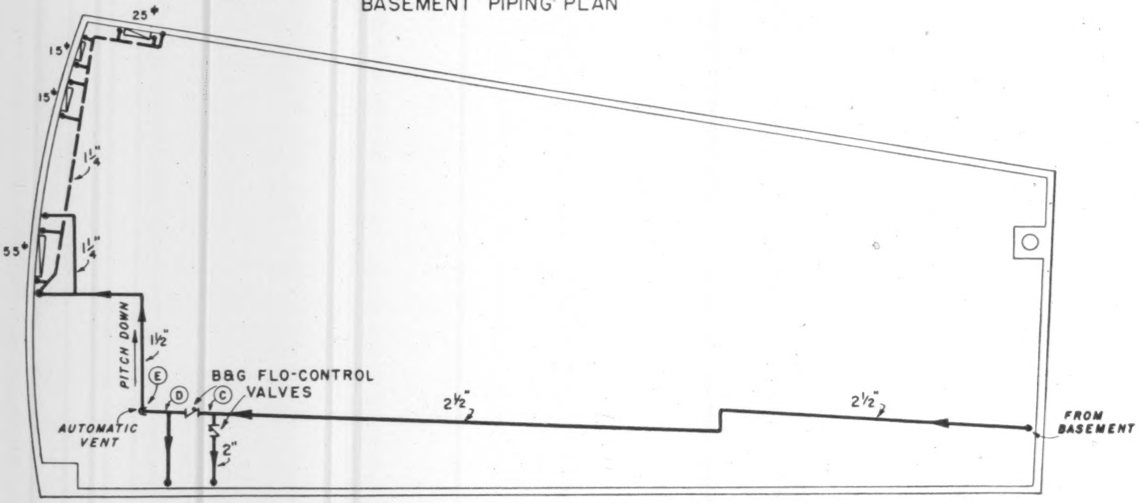
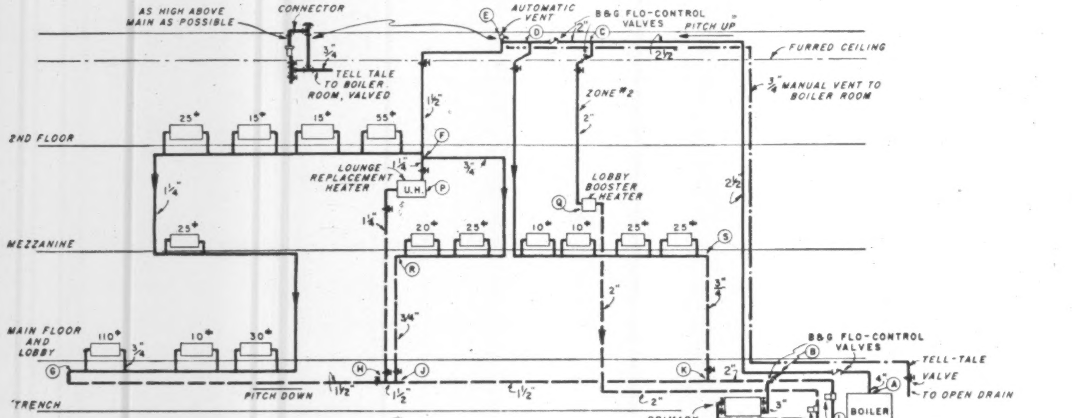
STUDIES IN FORCED HOT WATER


G
110
3/4"
10
1/2
30
1/2"
1 1/4"
H
J
1 1/2"
K
2"
1 1/2"
FROM Q
BOILER
ZONE 1
ZONE 2
ZONE 3
4"
FCV
3"
PRIMARY HEATING STACK
2 1/2"
RISE
2"

BASEMENT PIPING PLAN


25
15
15
1 1/4"
55
1 1/4"
PITCH DOWN
1 1/2"
E
D
C
B&G FLO-CONTROL VALVES
AUTOMATIC VENT
2"
2 1/2"
2 1/2"
FROM BASEMENT

ROOF PIPING PLAN


AS HIGH ABOVE MAIN AS POSSIBLE
CONNECTOR
3/4
TELL TALE TO BOILER ROOM, VALVED
E
AUTOMATIC VENT
D
2"
C
B&G FLO-CONTROL VALVES
PITCH UP
2 1/2
FURRED CEILING
3/4" MANUAL VENT TO BOILER ROOM
ZONE #2
2"
1 1/2"
2ND FLOOR
25
15
15
55
F
LOUNGE REPLACEMENT HEATER
1 1/4"
3/4"
U.H.
P
LOBBY BOOSTER HEATER
Q
2 1/2"
1 1/4"
1 1/4"
MEZZANINE
25
20
25
10
10
25
25
S
R
2"
3/4"
3/4"
MAIN FLOOR AND LOBBY
110
10
30
3/4
G
H
J
K
2"
PITCH DOWN
1 1/2"
1 1/2"
1 1/2"
2"
TRENCH
B&G FLO-CONTROL VALVES
B
TELL-TALE VALVE
TO OPEN DRAIN
4"
A
BOILER
L
3"
3"
PRIMARY HEATING STACK
ZONE #3
M
M
H 2 1/2" B&G BOOSTER - ZONE #1
H-3" B&G BOOSTER - ZONE #2
PD-37 B&G BOOSTER - ZONE #3

HEATING SYSTEM DESIGN

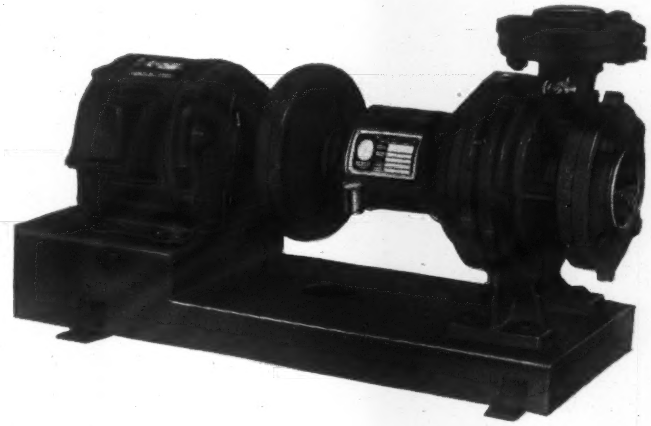
ENGINEERING MANUAL
BELL & GOSSETT COMPANY

A Monoflo Forced Hot Water Heating System for a 1500-Seat Motion Picture Theater

This presents an interesting design example because of the wide variation in heating requirements of the auditorium, rest rooms, lobby and offices. It also points up the desirability of forced hot water heating for an installation of this kind because of the ease with which the system can be zoned. Further, the water temperature can be accurately modulated and controlled to meet constantly changing demand conditions.

The radiation in the three zones of the system is free standing cast iron in offices, unit heaters for lounge and lobby and heating coil for air conditioning unit.

Complete design details for this installation are given in the B&G Engineering Manual. See your local B&G Representative for a copy.



B&G CIRCULATING PUMPS . . . FOR *QUIET*, DEPENDABLE, LEAK-PROOF OPERATION

B&G Booster and Universal Pumps are not ordinary centrifugal units . . . they are specifically designed and built to meet the exacting requirements of forced hot water heating systems.

These pumps are distinguished by numerous features which assure *silent*, *vibrationless* operation as well as years of dependable service. Among them are the specially built motors, tested for quietness . . . oversized shafts of hardened alloy steel . . . long bronze sleeve bearings . . . silent spring-type couplers . . . oil lubrication and water-tight mechanical seals.

Both Boosters and Universal Pumps can be serviced without breaking pipe connections. Removal of a few bolts permits separation into three parts—all the advantages of split case design.

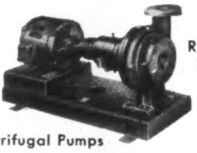
For complete data, send for Bulletins IA-856 and HQ-856 . . . see why B&G Boosters and Universal Pumps are the standard of comparison. Over 2,000,000 are in operation today.

A COMPLETE LINE OF EQUIPMENT FOR HEATING AND COOLING WITH WATER

Monoflo Fittings

Relief and Reducing Valves

Compression Tanks


Centrifugal Pumps

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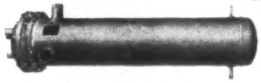
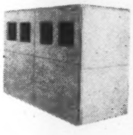
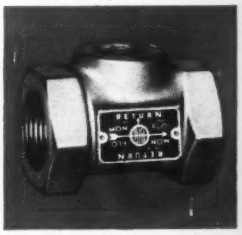
Flo-Control Valves


Evaporators and Condensers


Package Liquid Coolers

B&G Monoflo Fittings for single main systems



B&G Monoflo Fittings are carefully engineered to diversion capacities best suited to correct system design. Extremely high resistance in a fitting limits the number which can be installed in a circuit and creates other disturbances which prevent efficient circulation. By using one or two Monoflo Fittings, depending upon the size of the heating unit and distance from the main, an accurately balanced system is achieved.

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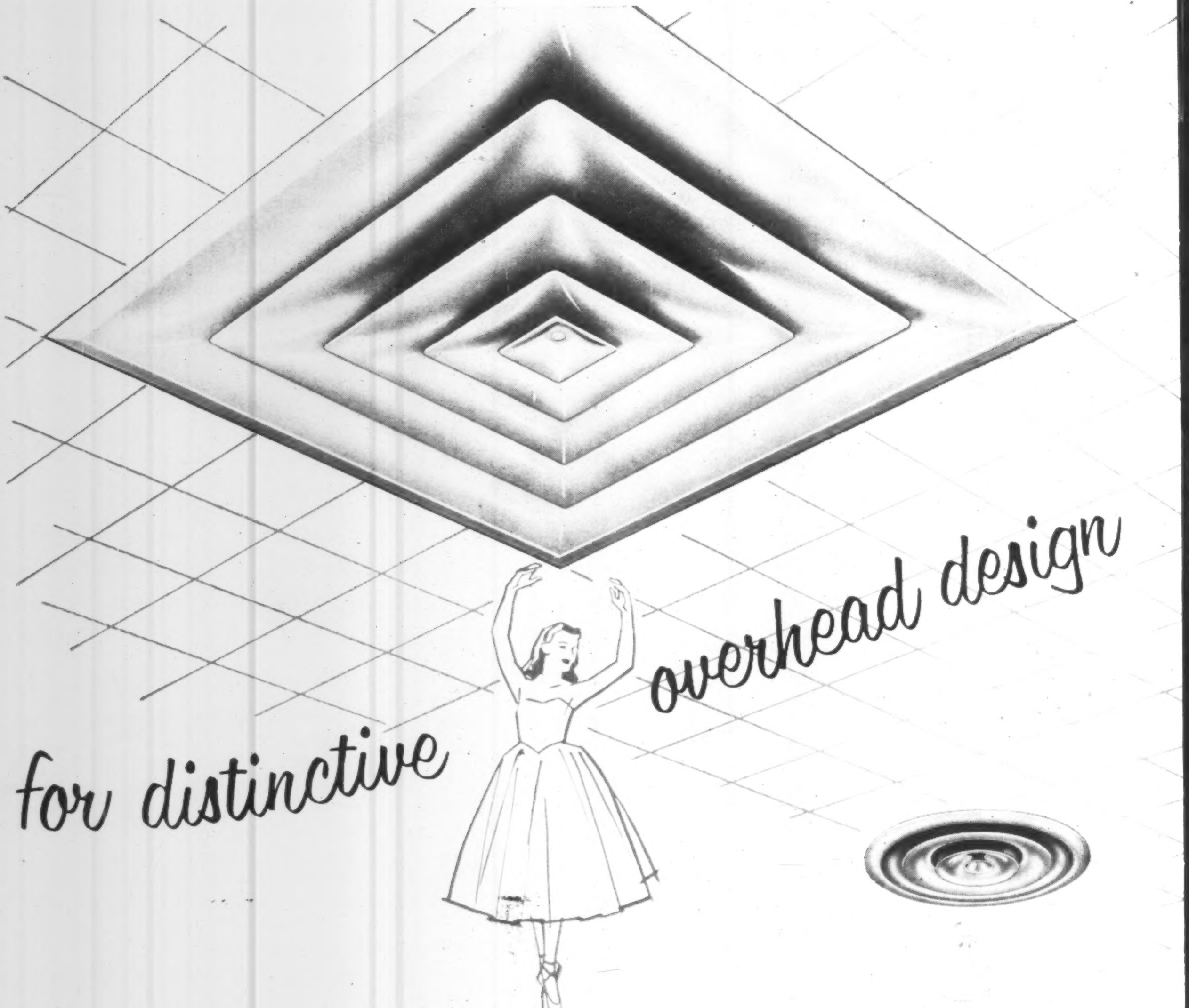
Dept. EX-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario


for distinctive
overhead design

CEILING DIFFUSERS

designed by TITUS

- **SUPERB ULTRA MODERN STYLING**

...These new ceiling diffusers give any room a dignified "room of tomorrow" look! All Titus ceiling diffusers—regardless of type—size—or shape—are so styled and proportioned that they blend harmoniously with each other and with room surroundings.

- **SUPERIOR DIFFUSION PERFORMANCE**

...New exclusive *curved contour cone design*—plus extreme adjustability—make these outstanding precision air diffusion outlets EQUALLY EFFICIENT FOR HANDLING EITHER COOLED OR HEATED AIR.

- **UNIFORM APPEARANCE**

...Regardless of air pattern setting—Titus Ceiling Diffusers always present a uniform appearance because 3 center cones move in unison and retain same relative position.

- **SIMPLE TO INSTALL-ADJUST**

...Ingenious spring lock arrangement for quick, easy installation or removal—saves time and labor. Adjustable at the factory—or on the job. On Titus adjustable round diffusers, simply turn small center cone to adjust to any air pattern.

- **A COMPLETE LINE**

...Titus Ceiling Diffusers are available in round, square and half round models in all standard sizes. Rigid steel construction—beautiful metalescent aluminum finish. Also a complete line of accessories—including ceiling cones, radial volume control dampers and plaster mounting rings.

...specify the New Complete Line

TODAY'S OUTSTANDING AIR CONDITIONING ACHIEVEMENT
FOR HANDLING OVERHEAD AIR *Gracefully* WITH PRECISION

FREE
CATALOG

ceiling diffusers
TITUS

TITUS MFG. CORP. WATERLOO, IOWA

Gentlemen: I am interested in full details (engineering data, prices) on your new complete line of Ceiling Diffusers and Accessories. RUSH NEW, FREE CATALOG.

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the all-new
Dravo COUNTERFLO *heater*
introduces

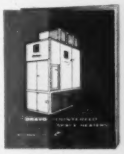
a new concept in burning fuel

Developed by the most exhaustive research program ever undertaken in the field, the new Dravo *Counterflo* heater introduces an entirely new concept in the burning of fuel. This new concept involves not only many entirely new and exclusive Dravo features, but integrates every part of the heater into a "unitized" design. The functions of the principle elements—burner, combustion chamber, fans and discharge plenum—work in complete harmony, with the result that they extract every possible Btu from the fuel, transmit the heat to the airstream with unmatched efficiency, and distribute the heated air uniformly. Look at these outstanding features of the all-new Dravo *Counterflo:*

- **NEW DISCHARGE PLENUM**—distributes heated air at high velocity without annoying drafts.
- **NEW AIRFOIL COMBUSTION CHAMBER**—stainless steel, ribbed for extra strength and channeling of airflow—guaranteed for 10 years.
- **NEW INDUCED DRAFT FIRING**—automatically controls fuel/combustion air ratio, adds extra safety, extra efficiency.
- **NEW PYROJET BURNER**—exclusively Dravo—first burner developed specifically for direct-fired space heaters. Burns heavy No. 5 oil efficiently. Switches from gas to light oil automatically.
- **NEW LOW-SPEED FANS**—forwardly curved, low-speed, double inlet fans with high efficiency reduce horsepower requirements in the new *Counterflo* drastically.

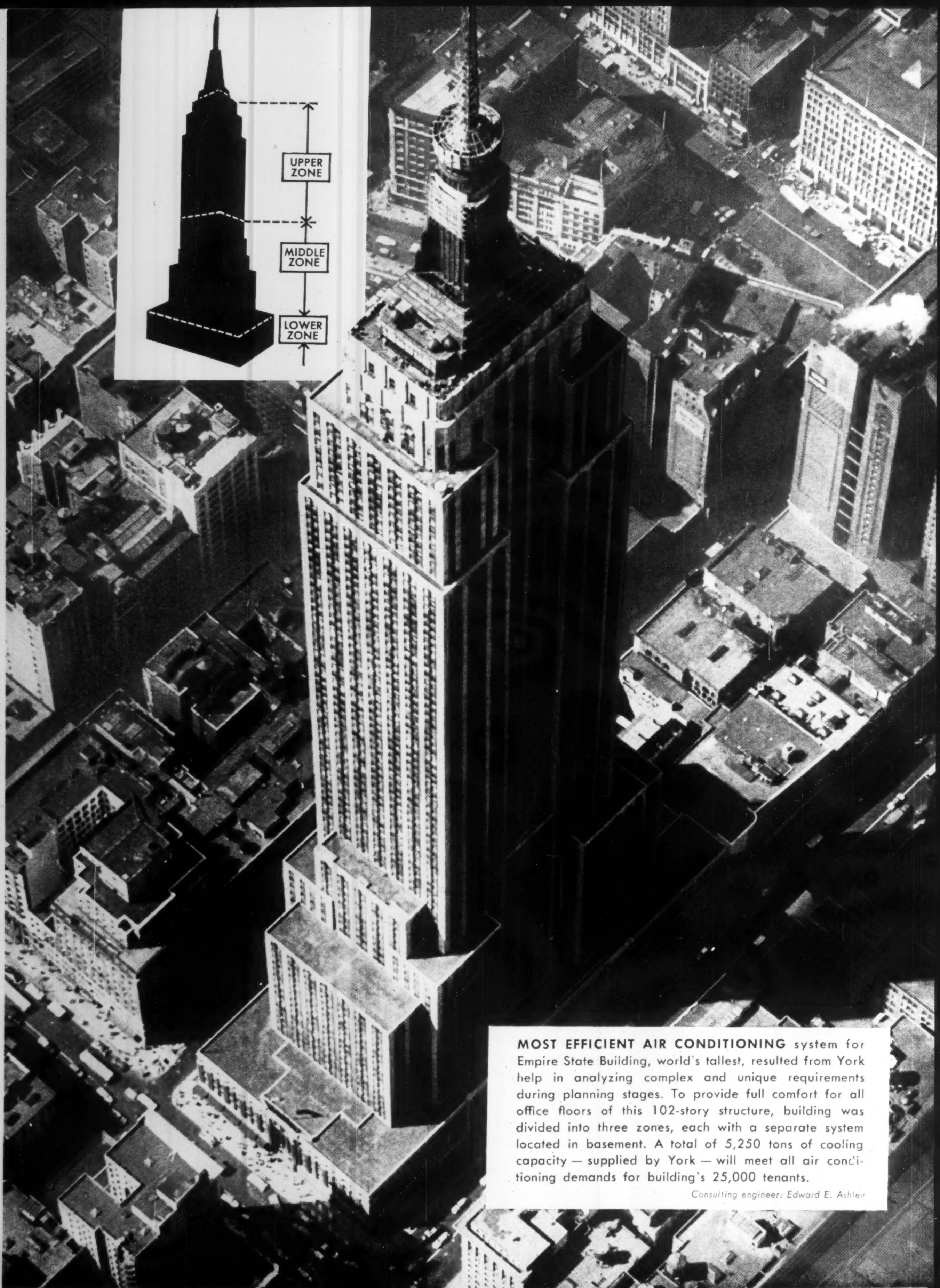
The new Dravo heater is extremely adaptable. Separate furnace section perfect for use as duct-type furnace, suitable for air conditioning, process drying and air tempering applications. May be mounted in any position to save space. Check with your Dravo representative for full information on this amazingly versatile heater, or write to Dravo Corporation, Pittsburgh 22, Pennsylvania.

Ask for Bulletin 564-18



DRAVO
CORPORATION

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation



MOST EFFICIENT AIR CONDITIONING system for Empire State Building, world's tallest, resulted from York help in analyzing complex and unique requirements during planning stages. To provide full comfort for all office floors of this 102-story structure, building was divided into three zones, each with a separate system located in basement. A total of 5,250 tons of cooling capacity — supplied by York — will meet all air conditioning demands for building's 25,000 tenants.

Consulting engineer: Edward E. Ashley

YORK® PRIOR PLANNING SERVICE controls air conditioning costs by early analysis of system needs

- Today, air conditioning systems often must provide precise indoor climatic control, season long, even year-long, reliability.
- Each system represents a major investment on which employee and client good-will depends, or which product quality demands.
- York's 5-point PRIOR PLANNING SERVICE assures precise technical data on system needs early in the planning stages to help consultants, architects, and contractors design a better system, eliminate costly changes later on.

Take any two buildings. Even twin buildings on opposite sides of a street. With identical air conditioning problems to be solved, the systems used may differ widely. That's why through York's Prior Planning Service, York stands ready to provide a comprehensive and detailed technical analysis of system needs. York's long experience and leadership in all phases of air conditioning assure you an accurate analysis of *all* factors which affect system design including:

- **heat load**
- **body load**
- **traffic conditions**
- **climate conditions**
- **temperatures required**
- **power availability**

Armed with this information, it is then possible to design a system that will meet the needs precisely . . . without unnecessary initial expense or costly changes later on.

Through Prior Planning Service, the York sales engineer brings to your air conditioning problem unparalleled experience. Recent buildings served by York include New York's Empire State Building, Denver's Mile High Center, Philadelphia's 3 Penn Center Plaza, San Francisco's Equitable Life Assurance Society Building, Miami Beach's Fontainebleau Hotel, Minneapolis' Southdale Shopping Center, and Chicago's Palmer House Hotel.

You may rely with complete confidence upon the good judgment and recommendations of the York engineer. Call him *early* in your planning, or write York Corporation, subsidiary of Borg-Warner Corporation, York, Pa. In Canada, Canadian Ice Machine Co., Toronto.

PRIOR PLANNING SERVICE works 5 ways

1. **EARLY ANALYSIS** gives you all the technical data needed to make decisions.
2. **PROPER SELECTION OF EQUIPMENT.** York supplies *all* types, can be objective in recommending the equipment that is right for the job.
3. **BEST USE OF TIME, MATERIALS.** York can help consulting engineers, contractors and architects on space, design specification problems, avoid costly changes later.
4. **INSTALLATION SUPERVISION.** When desired, York supervises system installation, tests and adjusts it, trains operators on how to utilize all of its outstanding capabilities.
5. **MAINTENANCE SERVICE.** When you specify York, a York Certified Maintenance Contract can also be specified assuring regular system inspection, 24-hour emergency service, all repairs, complete reports on the system's condition.

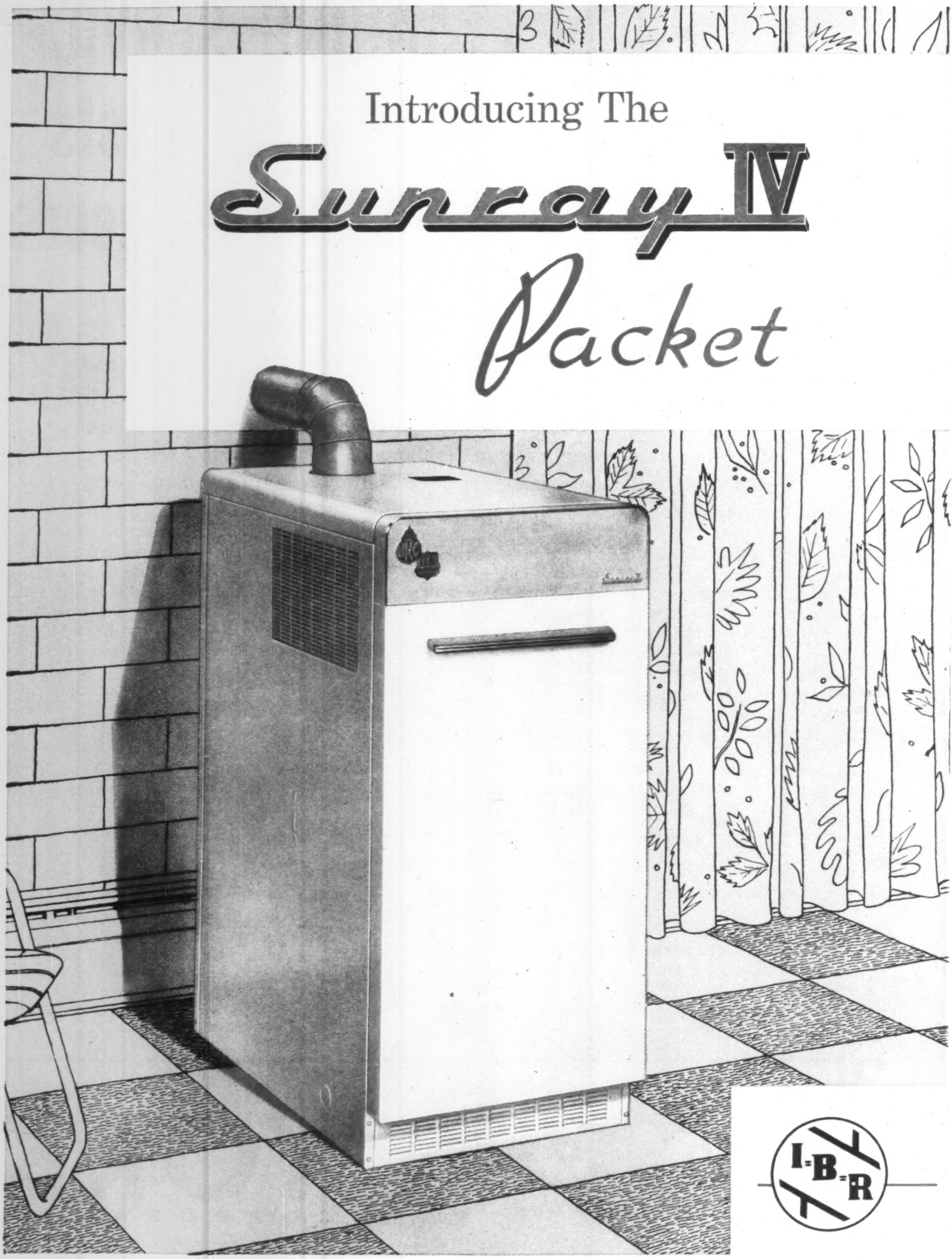
York
refrigeration
air conditioning

the quality name in air conditioning

® YORK B-W

HEADQUARTERS
FOR MECHANICAL COOLING
SINCE 1885

YORK
CORPORATION
SUBSIDIARY OF BORG-WARNER CORPORATION


Introducing The
Sunray IV
Packet
I=B=R

- The World's Most Beautiful and Efficient Cast Iron Boiler
- More Profits for *you* thru Factory Assembly and Wiring

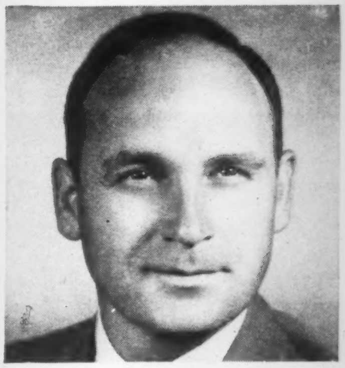
The Sunray IV

Hydronic Heating at its Finest*

- **Preassembled for easy installation**
- **Designed for Sales Appeal**
- **Engineered for Perfect Performance**
- **Built for Lifetime Service**
- **Available in Popular Sizes**
- **Backed by Strongest Sales Promotion**

The Sunray IV Packet is an oil fired residential boiler for steam or hot water heating. It is also available as an Oil Heating Unit and as an Automatically Fired Boiler.

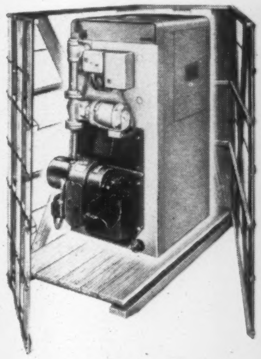
*HYDRONICS: *The science of heating and cooling with water.*



"Worth Waiting For"

Says *Paul R. Winters*
84 Trapelo Road
Belmont, Mass.

And you'll be glad, too, now that you can offer the finest in cast iron oil heating units for gravity or forced hot water heating, or for steam boiler replacement. The National-U.S. *Sunray IV* incorporates all the design and construction features you and your customers have been looking for in quality home heating. For the first time, here's a packaged heating unit with real sales appeal and *outstanding benefits* to you as a contractor.



National-U.S. Radiator

Sunray IV

All-in-One Automatic Oil-Fired Home Heating Unit

Packet

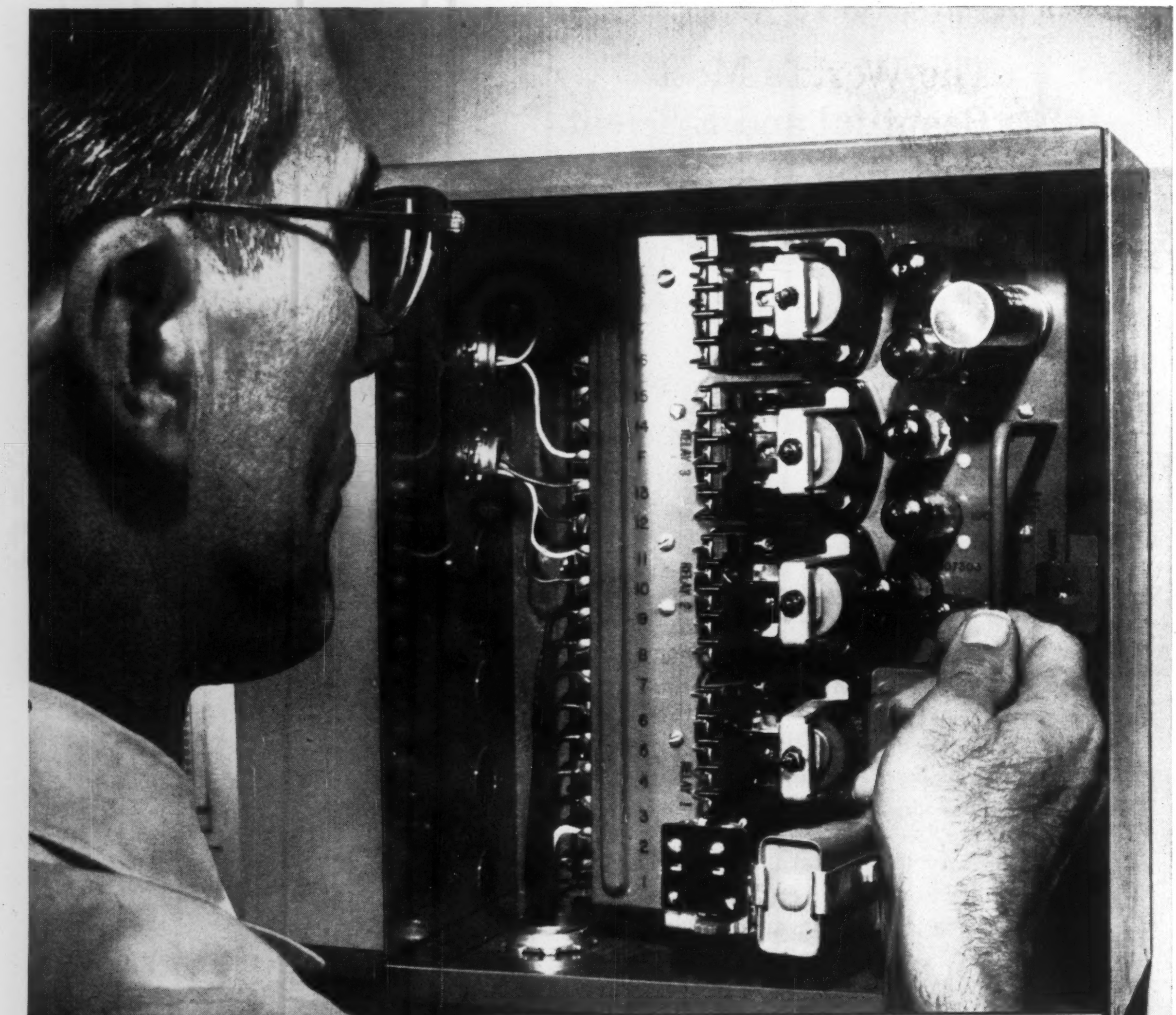
Send for free data
Write today for catalog on the new Sunray IV Packet and valuable sales aids available to National-U.S. contractors.

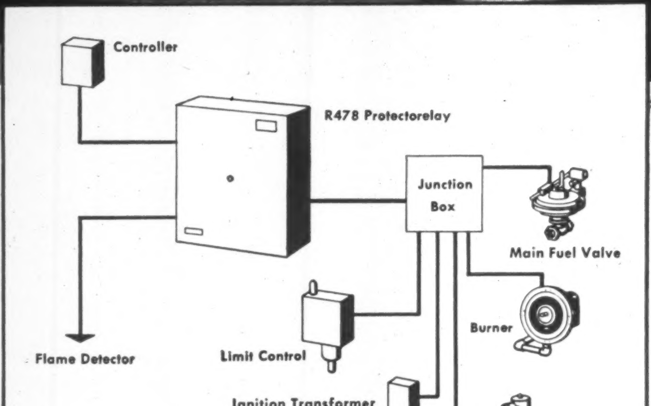
Sunray IV
CAST IRON OIL

National-U.S. Radiator
CORPORATION

HEATING AND AIR CONDITIONING DIVISION
Johnstown, Pennsylvania

HA-17




Controller
R478 Protectorelay
Junction Box
Main Fuel Valve
Burner
Flame Detector
Limit Control
Ignition Transformer
Pilot Valve

The new R478 Protectorelay you see being installed above assures you a safe start after each power interruption regardless of length or cause. Every time power returns, the electronic network must prove itself to be safe before the burner can be started. With power on during stand-by the electronic circuit checks itself continuously. The R478 responds instantly to flame failure, providing immediate burner shutdown and post purge.

A flame safeguard for commercial burners

New Honeywell R478 Protectorelay*

gives your customers the ultimate in

Safety • Performance • Flexibility

- **Choice of flame detection**—R478A for flame rectification (flame sensing rod and photo cell). R478B for Flameguard (lead sulphide cell).
- **Choice of burner sequencing**—choose from:
  - Pre-purge period either 5 or 30 seconds.
  - Proved or unproved pilot or direct ignition.
  - Intermittent or interrupted pilot.
  - Ignition timing either 15 or 60 seconds.
  - Low fire start with return to firing rate control either when main fuel valve opens or at end of ignition period.

In combination gas-oil burners one sequence can be selected for gas firing, another for oil firing.

- **Choice of manual or automatic starting.**
- **Wide selection of voltage**—voltage selector permits use on 120, 208 or 240-volt 60 cycle service. Separate model available for 50 cycle.
- **Broad range of applications**—precision engineered for large conversion burners—such as horizontal rotary, mechanical, air or steam atomizing and forced draft gas—also for steam generators and floor standing heaters.
- **Fast dependable electronic detection and timing**—R478 responds *instantly* to flame failure. Then, vacuum-tube rectifiers assure uniform electronic timing of sequences.
- **Easy to install.**
- **Lower maintenance costs**—Time-proven Honeywell components—unaffected by friction, dust or corrosion—assure constant efficient operation.

Honeywell manufactures a complete line
of heating controls for all types of oil
and gas burners. With Honeywell you can
rely on one supplier for all of your
controls. For information on the R478
or on any of our other controls, call your local
Minneapolis-Honeywell office. Or, write
Dept. HA-8-140, Minneapolis 8, Minn.

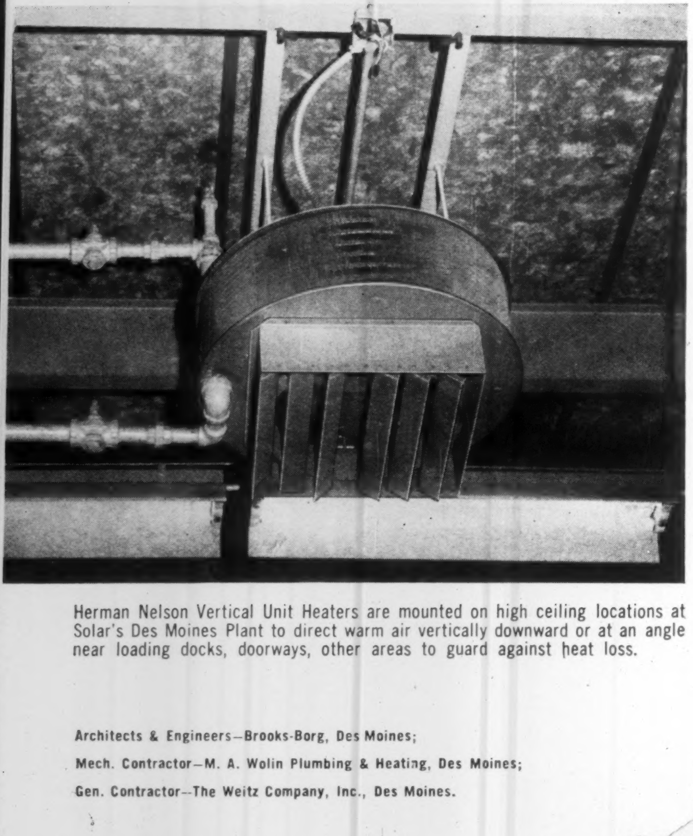
Honeywell

H HONEYWELL *First in Controls*

**trademark*

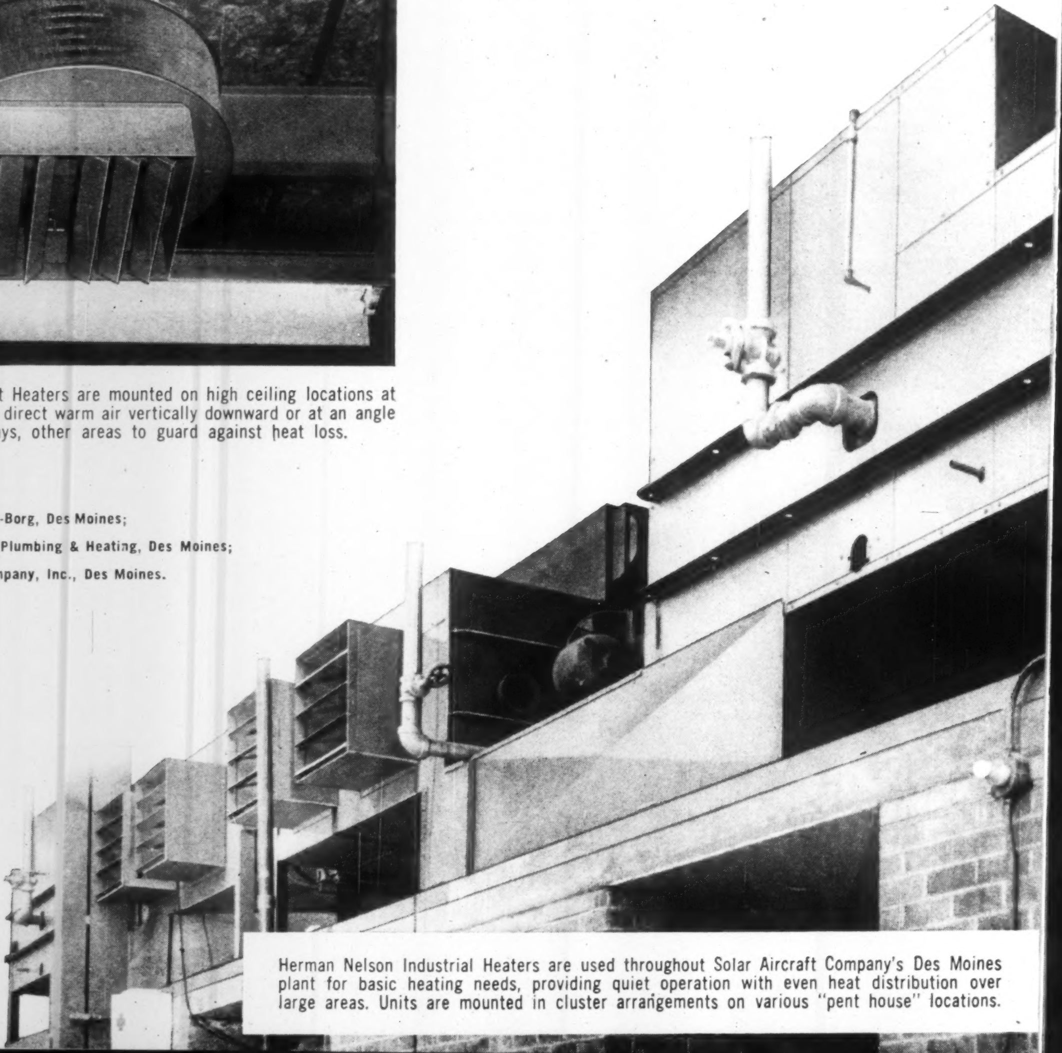
exactly what Solar Aircraft Company the Herman Nelson **department store** of **ventilating equipment !**

From the vast Herman Nelson line, it was easy for Solar Aircraft Company to choose just the *right* units, in the *right* capacities, needed to solve all heating problems at its huge Des Moines plant. Solar, with headquarters at San Diego, California, is a major supplier of heat resistant alloys to the aircraft industry. It is typical of the many top-flight manufacturers that look to Herman Nelson for precision performance, guaranteed results in heating and ventilating.



Herman Nelson Vertical Unit Heaters are mounted on high ceiling locations at Solar's Des Moines Plant to direct warm air vertically downward or at an angle near loading docks, doorways, other areas to guard against heat loss.

Architects & Engineers—Brooks-Borg, Des Moines;
Mech. Contractor—M. A. Wolin Plumbing & Heating, Des Moines;
Gen. Contractor—The Weitz Company, Inc., Des Moines.



Herman Nelson Industrial Heaters are used throughout Solar Aircraft Company's Des Moines plant for basic heating needs, providing quiet operation with even heat distribution over large areas. Units are mounted in cluster arrangements on various "pent house" locations.

needed from **heating** and

AAF

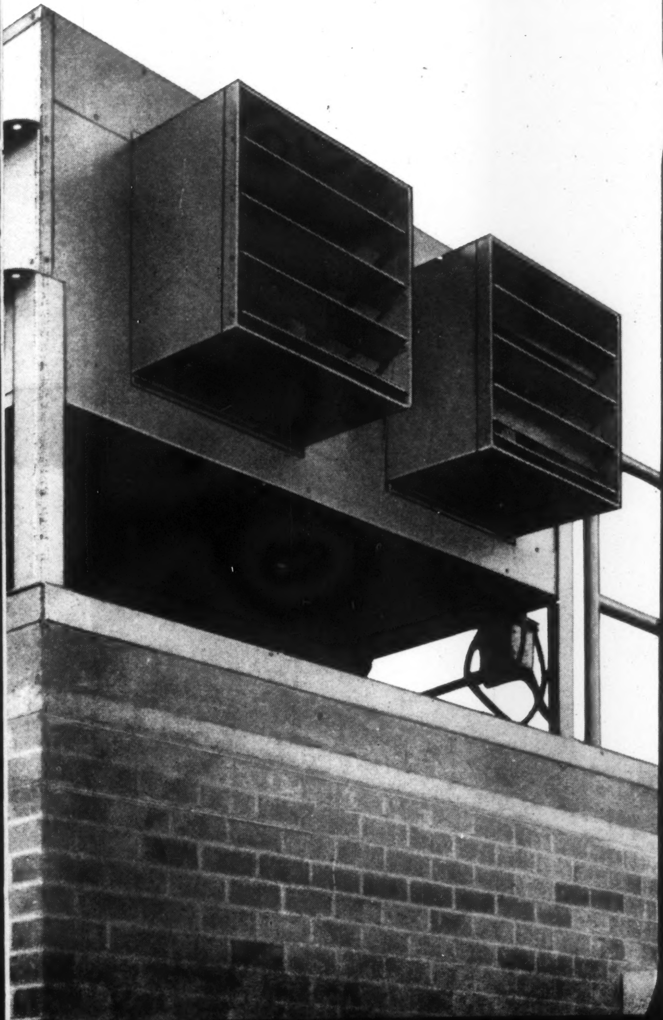
Herman Nelson

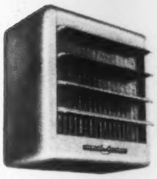
American Air Filter

Company, Inc.

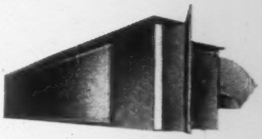
373 Central Avenue, Louisville 8, Kentucky

BETTER AIR IS OUR BUSINESS



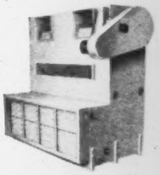


Horizontal Unit Heater Available in 18 sizes, designed for ceiling suspension and also to use either steam or hot water. Quiet operation; compact design. Catalog No. 700.

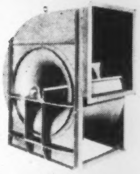


Roll-O-Vent Air handling units that change their own filters automatically. Media loads like a camera, lasts up to a year. Catalog No. 780A.

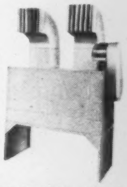
Vertical Unit Heater For high ceiling installations. Discharges air vertically downward or at angle to vertical in various directions. Steam or hot water. Catalog No. 700.



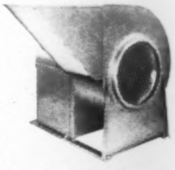
Air Conditioning Unit New type air-conditioning units for low cost commercial and industrial applications. Delivers up to 15,000 cu. ft. clean, cooled air per min. Catalog No. 785.



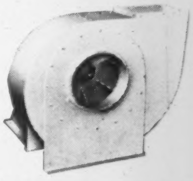
Centrifugal Fan Available in either slow speed or non-overloading types; 17 wheel diameters from 12¼" to 73"; 8 arrangements for direct or belt drive. Catalog No. 850.



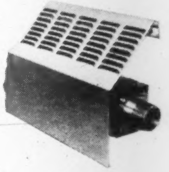
Industrial Heater Replaces exhausted air, balances minus pressures. Big capacity — does the job of many smaller, propeller-type units. Catalog No. 750.



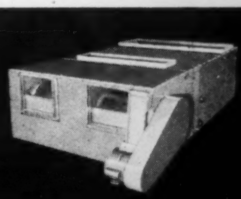
Unit Blower Years-ahead features in new "packaged" Unit Blowers. Compact, spacesaving, easy to service. Wide range of unit sizes. Catalog No. 826.



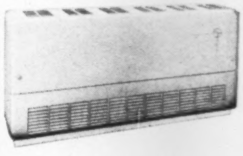
Industrial Exhauster Exclusive hub assembly cuts maintenance & replacement costs. New impeller design; heavy duty shaft & bearings. Catalog No. 860.



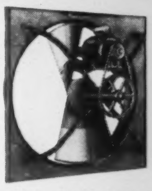
Finned Radiation Available steel fins on steel tubing or aluminum fins on copper tubing. Light-weight, suitable for exposed or concealed installation. Catalog No. 790.



Heating & Ventilating Unit Hangs on ceiling, out of the way, or mounts on wall or floor. Quiet operation, slow speed, with completely rotable fan sections. Catalog No. 775.

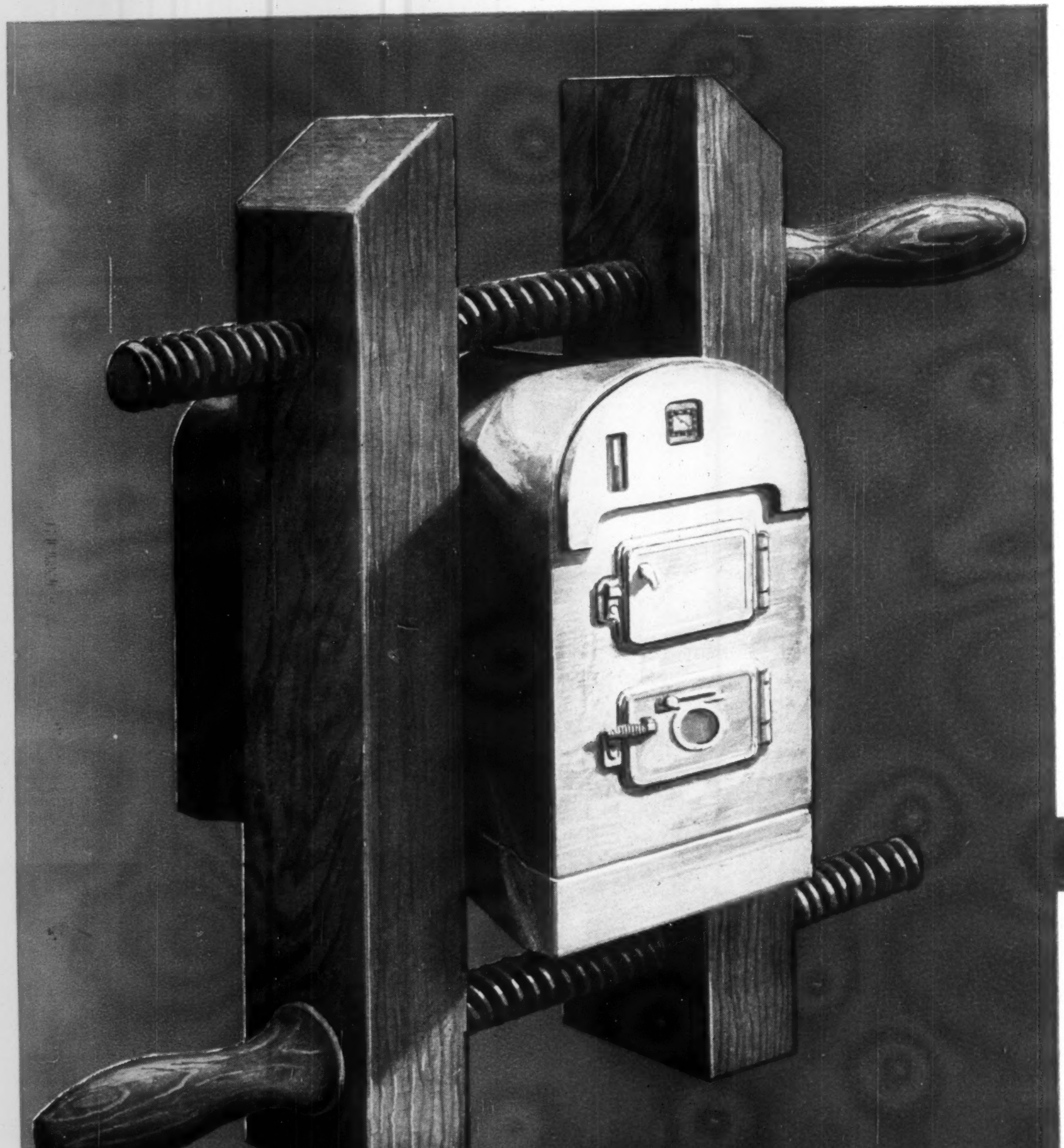


Console Heater 16 models — 64 air inlet-outlet arrangements. Fully-recessed, semi-recessed or free-standing applications. Smartly designed. Catalog No. 727.



Propeller Fan Operates horizontally or vertically; belt or direct drive. Wide range of sizes in both types. Capacities to 36,150 CFM. Low operating cost. Catalog No. 800.

HERE'S THE WAY TO BEAT THE SQUEEZE ON BOILER SALES

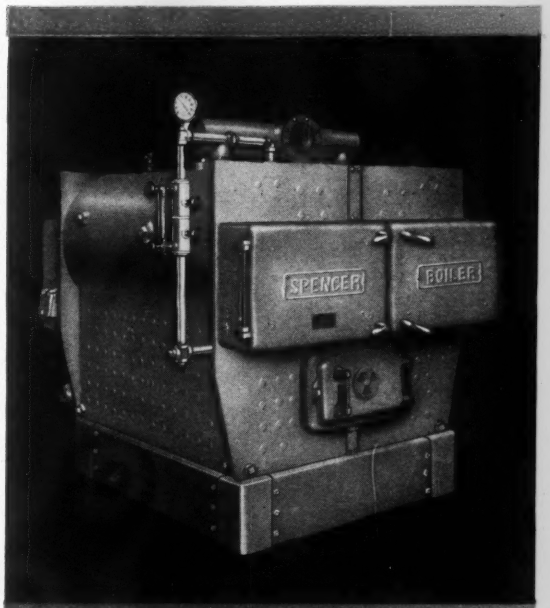


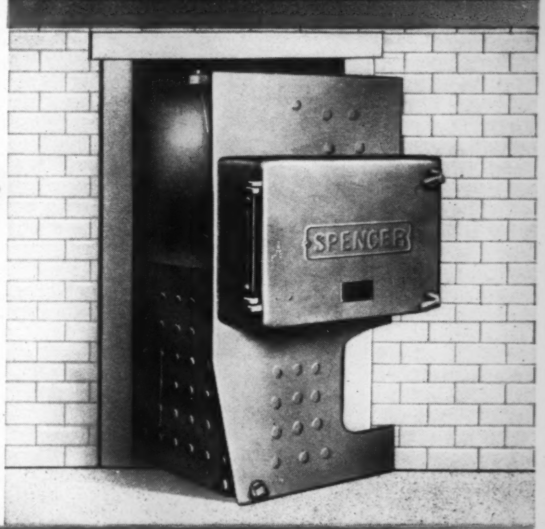
Here's the one boiler that enables you to land more installations in the booming commercial construction market.

install the unique

SPENCER "LW"

No other boiler offers these important product advantages to builders



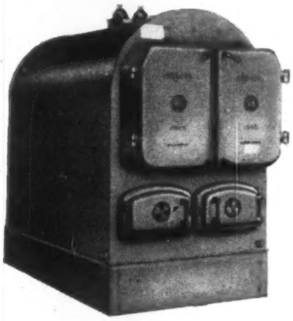


Lower waterline—over-all height of Spencer "LW" is approximately 25% less than conventional firebox boilers . . . eliminates pit usually required in new buildings for these commercial boilers . . . saves the builder high costs of excavation . . . returns high profits.

Built in two sections—in existing buildings, divided design permits entry through narrow basement openings. In modernization, the builder is saved cost of tearing out walls. The two watertight sections are moved in separately with no welding needed.

The Spencer "LW" Divided, Low-Waterline Boiler has been proven in the field—acclaimed by contractors and builders as the ideal solution to problems of low headroom, excavation and limited entry space for both existing and new construction. The Spencer "LW" Boiler is available in a complete range of sizes from 2,200 to 42,500 sq. ft. steam SBI ratings.

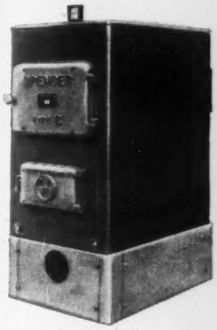
THE SPENCER LINE CAN BUILD UP YOUR BOILER BUSINESS



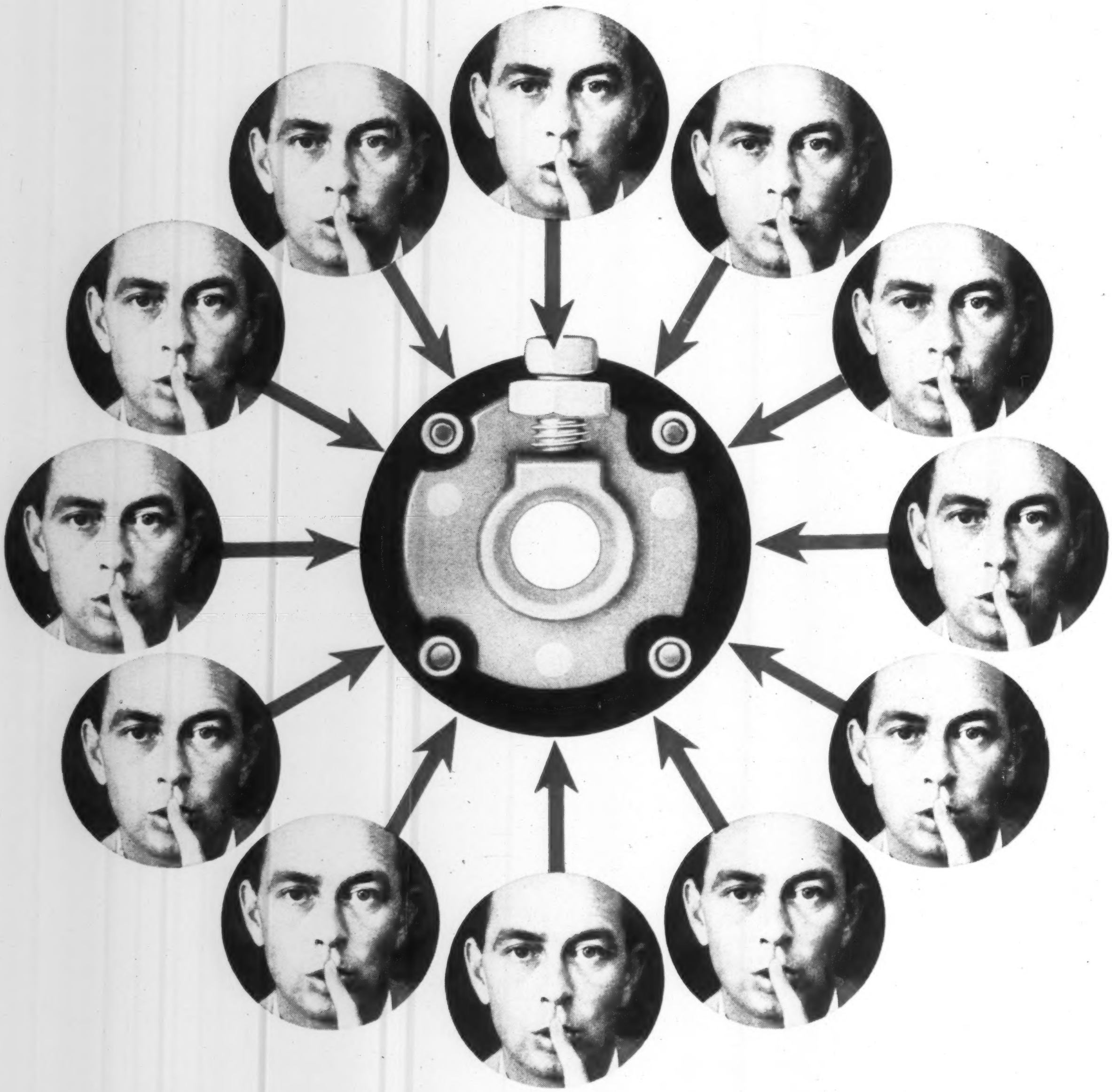
SPENCER "A." Complete range of sizes from 3,500 to 50,000 sq. ft. steam, SBI ratings. For every building . . . for every fuel.

SPENCER
HEATER
LYCOMING DIVISION
WILLIAMSPORT AVCO PENNSYLVANIA

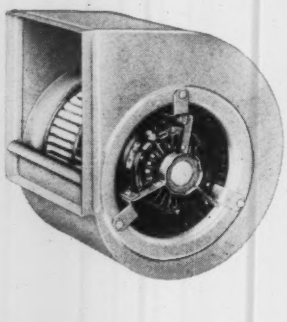
For complete details on the boilers shown, or any or the residential or commercial boilers in Spencer's complete line, write to Spencer Sales, Avco Manufacturing Corporation, Williamsport, Pennsylvania.



NEW SPENCER "C" Heavy-duty commercial boiler performance at a residential boiler price! Can be fired with oil, gas or coal.



SILENCE IS THE HUB* OF THE MATTER



*NEOPRENE Here at Utility we take a meager view of noise . . . believe it has no place at all in our Direct Drive Blowers. But licking the problem of noise was a challenge, and a tough one. The key point of noise is the blower hub. What material could be used to give it all the qualities of lifetime service, yet provide quiet operation under all conditions?
We found Neoprene to be the ideal material to shush noise. How to build that Neoprene Hub was and is the "secret of silence" of all Utility Direct Drive Blowers. This silence factor has boosted sales for manufacturers of heating, cooling, refrigerating and ventilating equipment the country over. Just another example of go-ahead planning, years-ahead engineering that makes Utility the firm to consult when considering only the best in blowers and parts to fill your manufacturing needs.

YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE! Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

A Division of Utility Appliance Corp.

UTILITY FAN CORP. 911 East 59th Street, Los Angeles 1, California

Export Division
141 So. El Camino Drive
Beverly Hills, Calif.
Cable: UTILIFAN, Los Angeles

Want *your* installations to start a "Chain Reaction"?

That's what happened when this man installed PLIOTRON filters in one of the New York hotels. The new filters did such an efficient, money-saving job that the hotel owners soon ordered them for the nine other hostelries in their chain.

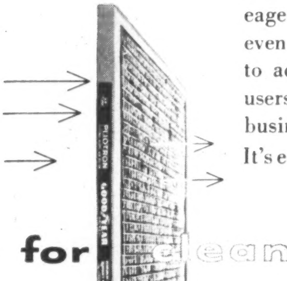
That sort of "chain reaction"—from PLIOTRON installations, large and small—is not unusual. Maintenance supervisors of multiple buildings eagerly standardize on standout items. And even one-shop and one-home owners are quick to advertise their satisfaction to fellow filter-users. In any case, you're in line for extra business.

It's easy to see why. Putting in PLIOTRON, means putting in extra-efficiency, electrostatic filters that attract and then trap as much as *5 times* the fine dirt particles as captured by ordinary types. For it's not a surface-loader—but a depth-loader. It stays on the job far longer between cleanings. Even then, a quick bath puts it back at full filter-power.

It's no mystery, then, why filter-users are willing to pay a little higher—in initial cost—for money savers like these. Or why most every PLIOTRON super-filter installation leads to more installations—and profits—for you. For the complete story, write:

Goodyear, P. O. Box 288, Akron, Ohio.

Pliotron—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio



for cleaner air everywhere-

PLIOTRON AIR FILTER BY

GOODYEAR

THE GREATEST NAME IN RUBBER

John Carroll University specifies Youngstown Steel Pipe for new Campus Service Building

This attractive new Service Building, parts of which are now under construction on the campus of Cleveland's John Carroll University, will contain a Gymnasium, Transportation Hall, Student Activities Center and a Student Dining Hall. To coordinate all the structure's physical functions, the University and its architect specified Youngstown Steel Pipe for its dependability and long life.

Youngstown Steel Pipe is made of only the highest quality steel by steelmen with over 56 years of pipemaking experience. All of Youngstown's fully integrated operations—from iron ore mining to finish pipe threading—are rigidly quality-controlled to provide the best steel pipe available anywhere. Why not make Youngstown your continuing specification for long life and trouble-free installations?

For additional information or service, call your local Youngstown distributor—or contact our nearest District Sales Office, today.

John Carroll University Service Building
Architect: Small, Smith, Reeb and Draz, Cleveland
General Contractor: Roediger Construction Inc., Cleveland
Plumbing & Heating Contractor:
The Gorman-Lavelle Plumbing & Heating Co., Cleveland
Distributor: Grinnell Company, Cleveland

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

SMALL SMITH REEB ARCHITECTS

Specify Youngstown and secure these 7 Points of uniform goodness

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

QUALITY YOUNGSTOWN SERVICE

Durable insulation finish protects and color codes lines, tanks, and vessels

You can be sure of long-lasting protection for insulation, both indoors and outdoors, with Armstrong Insulcolor. In addition, Insulcolor neatly color codes your lines, tanks, vessels, and ducts. Available in seven colors, plus a clean white, Insulcolor is quickly applied by conventional brush or spray methods. It will withstand all temperatures up to 160° F. without cracking, crazing, or peeling. Maintenance is easy; dirt washes readily from Insulcolor's smooth, tough plastic surface.

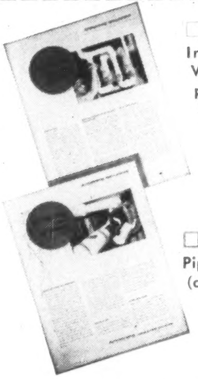
Insulcolor is one of many quality products in the Armstrong line of industrial insulations. Armstrong also offers you a complete contracting service, geared to install these products economically and efficiently.

For full details on Insulcolor or any other Armstrong insulations, send for free booklets. Check the ones you want on the coupon below.

Armstrong

INDUSTRIAL INSULATIONS

for temperatures from – 300° F. to + 3000° F.



☐ Armstrong Insulcolor®, Weatherproof Coating in Eight Colors

☐ Kaylo-20 Pipe Covering (data sheet)

☐ Armstrong Armaglas** Insulations for Piping, Tanks, and Vessels

☐ Armstrong Armatemp† Insulating Cements

Armstrong Cork Company
2508 Sherman St.
Lancaster, Penna.

Please send me the free booklets checked. ☐

Please have an Armstrong representative call. ☐

Name ....

Position ....

Company ....

Address ....

City .... **Zone** .... **State** ....

** T.M. Armstrong Cork Co. Manufactured by Owens-Corning Fiberglas Corp.
† Trade-Mark

A Small Plant Modernizes with
DETROIT STOKER

PIERCE·ROBERTS RUBBER CO·
TRENTON 6·NEW JERSEY

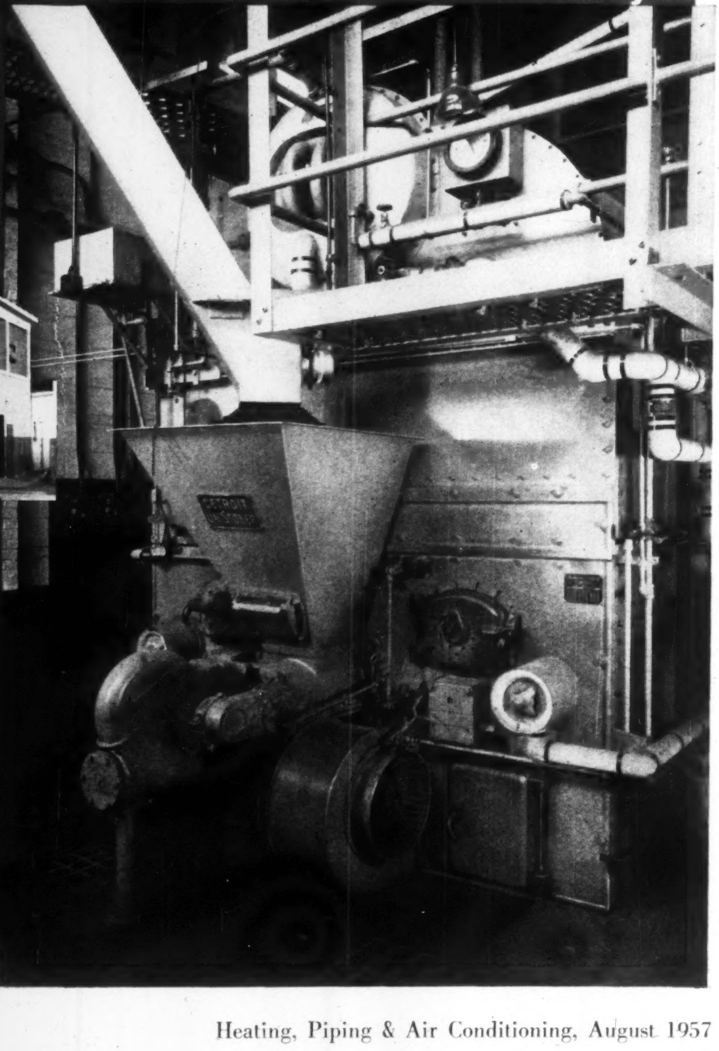
You don't have to have a giant plant to benefit from modernization, high efficiency and dependability of Detroit Stokers.

Here is a thoroughly up-to-date plant. Boiler, stoker, coal handling and storage, and ash handling are all modern, mechanized, efficient and clean.

A Detroit UniStoker fires a 200 horse power Keeler Type CP Boiler. Coal is automatically delivered to the stoker from a silo. Ashes are mechanically removed and stored. *No shoveling—no dirt.* Boiler operates up to 175% of normal rating at 125 p.s.i.

For large or small plants, Detroit Stokers provide modern, economical and dependable operation.

PENNELL & WILTBERGER
Consulting Engineers
Philadelphia



DETROIT
SINCE 1898
STOKERS

DETROIT STOKER
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MONROE, MICHIGAN

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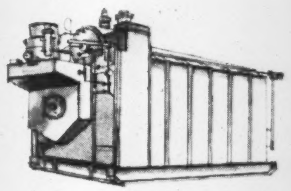
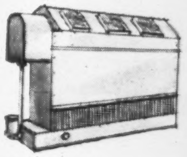
in Principal Cities

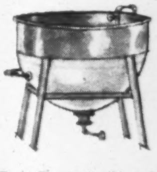
Now . . .
new acid cleaners



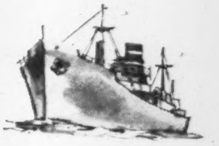
Steam Boilers, Condensers, Heat Exchangers, Piping



Air Conditioning Cooling Towers, Ice-Making Machines, Evaporating Condensers



Food-Processing Vessels, Pipelines, Gelatin Evaporators



Marine Salt-Water Evaporators and Heat Exchangers

in **dry** easy-to-handle form

Cleaners based on Du Pont Sulfamic Acid are safer, more convenient, non-fuming . . . dissolve in water to form effective, low-corrosive solutions

Now . . . acid cleaners you handle *dry!* No fumes or hazardous liquid spillage to worry about. When mixed with water, these cleaners have all the penetrating power of hydrochloric acid with far less corrosive effect. The key to these unusual properties is a remarkable new ingredient — Du Pont Sulfamic Acid.

Sulfamic acid-based cleaners remove scale and deposits from air conditioning and ice-making equipment; food-processing vessels; steam boilers; milk evaporators and pasteurizers; marine evaporators and heat exchangers. Cleaning action is fast, thorough. Downtime is eliminated in many cases because cleaners are added while equipment is in operation.

We'll gladly send you additional information on sulfamic acid-based cleaners and the names of formulators who offer these new compounds. Just mail the coupon below.

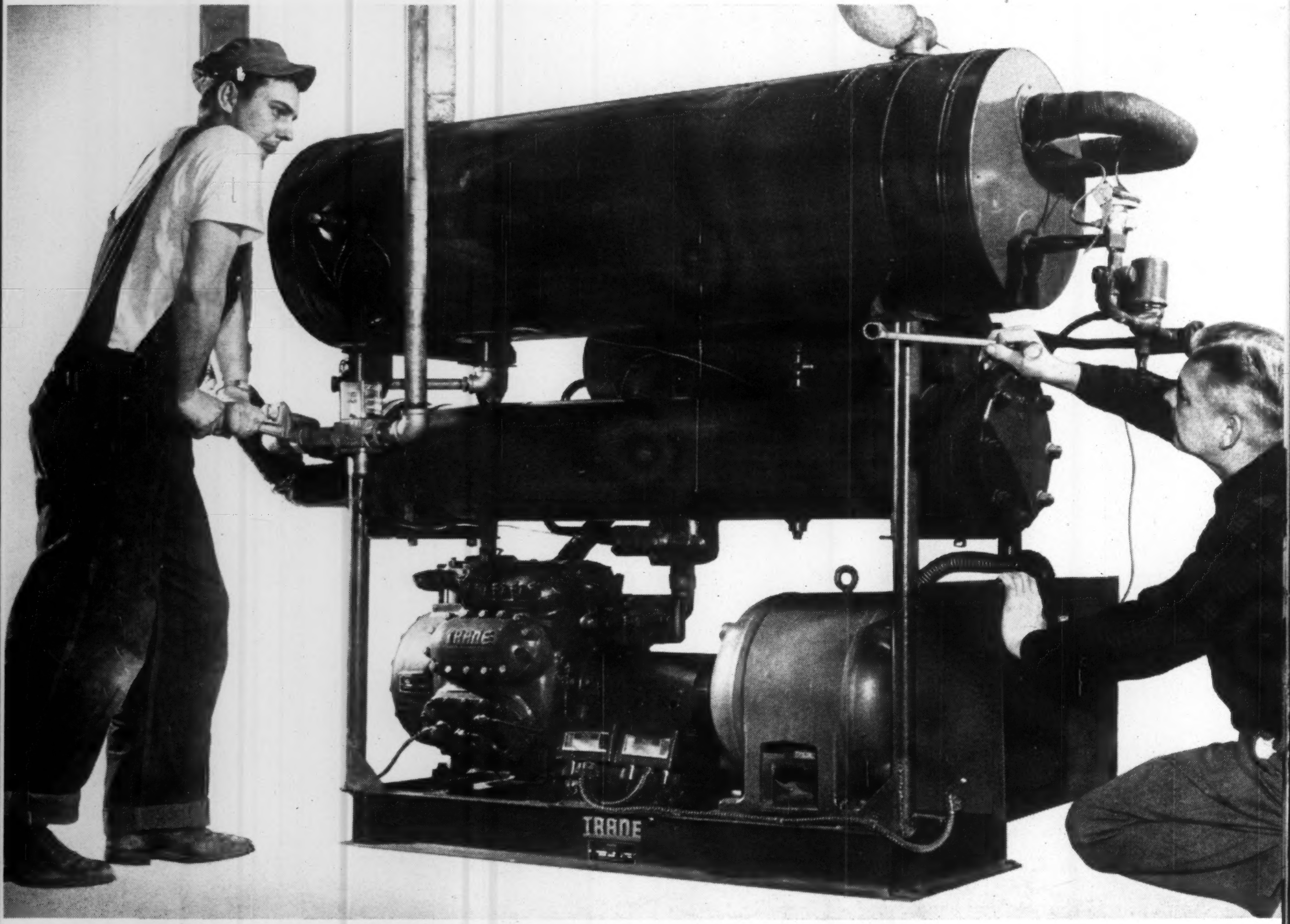
DU PONT
SULFAMIC ACID
DU PONT
REG. U. S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Grasselli Chemicals Dept., Room N-2533
Wilmington 98, Delaware

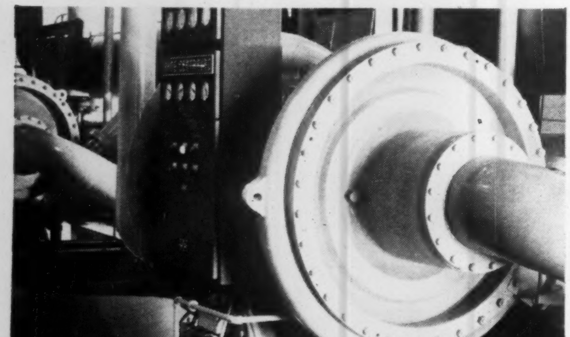
Please send me ☐ sulfamic acid general equipment cleaning bulletin; ☐ names of formulators offering cleaners based on sulfamic acid.

*Name*____________________
*Company*____________________
*Address*____________________
*City*__________ *State*__________

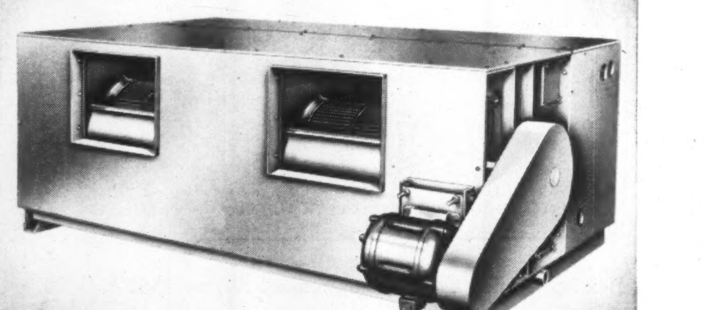
Now! Simplify design with Trane factory



FOR YOUR LARGER JOBS. The TRANE CenTraVac is the industry's first hermetic centrifugal—*and the best!* Needs no special bases, no field alignment. Install *anywhere* from basement to roof. Automatically supplies just the refrigeration needed, modulating down to 10% of capacity, *even lower.* Units of 50 to 1500 tons.



AIR HANDLING PACKAGE. The TRANE Climate Changer solves air handling design problems *faster—easier!* Factory pre-assembled units are sectionalized to simplify your client's installation. New fan assembly may be rotated in field to give you more freedom of design—give your customer complete flexibility of fan location. Capacities from 600 to 29,000 cfm.



...simplify installation pre-assembled units!

For refrigeration or air handling, turn to one source for package equipment for any size job . . . units from 3 to 1500 tons

You save design and engineering time—and give your customer satisfaction, too—when you specify TRANE factory pre-assembled, factory-tested equipment! No matter what the tonnage is, TRANE has the refrigeration and air handling equipment to do an outstanding job—with no complex installation problems; equipment that insures "*performance as specified.*"

TRANE pre-assembled components are *matched* components—designed and built together, to work together! Responsibility is centralized in one reliable source.

So whether it's a huge cooling-heating system for a multi-room building—or a self-contained unit for a shop or office—specify TRANE all the way for simplified design . . . simplified installation . . . lasting customer satisfaction! Ask your nearby TRANE Sales Office about the complete TRANE lines for 1957—or write TRANE, La Crosse, Wisconsin.

COMPLETE REFRIGERATION PACKAGE! The TRANE Cold Generator will handle refrigeration jobs from 10 to 150 tons. Built with TRANE dependability through and through, it has 4-step compressor modulation for lower power consumption, higher efficiency. Complete factory pre-assembly *includes automatic control panel* that eliminates much complicated on-the-job wiring, insures proper operation when installed. Remember, when you specify . . . the TRANE Cold Generator is a *complete refrigeration package!* 10 sizes from 10 to 150 tons.

For any air condition, turn to

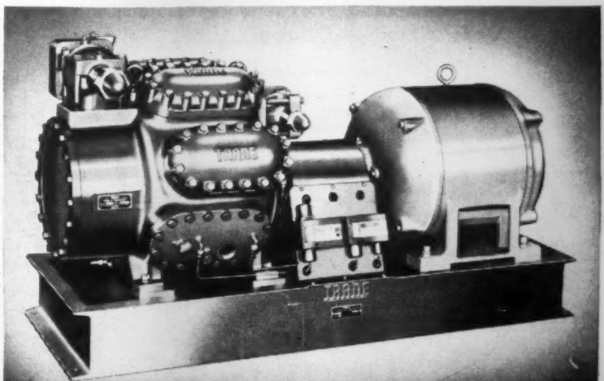
TRANE

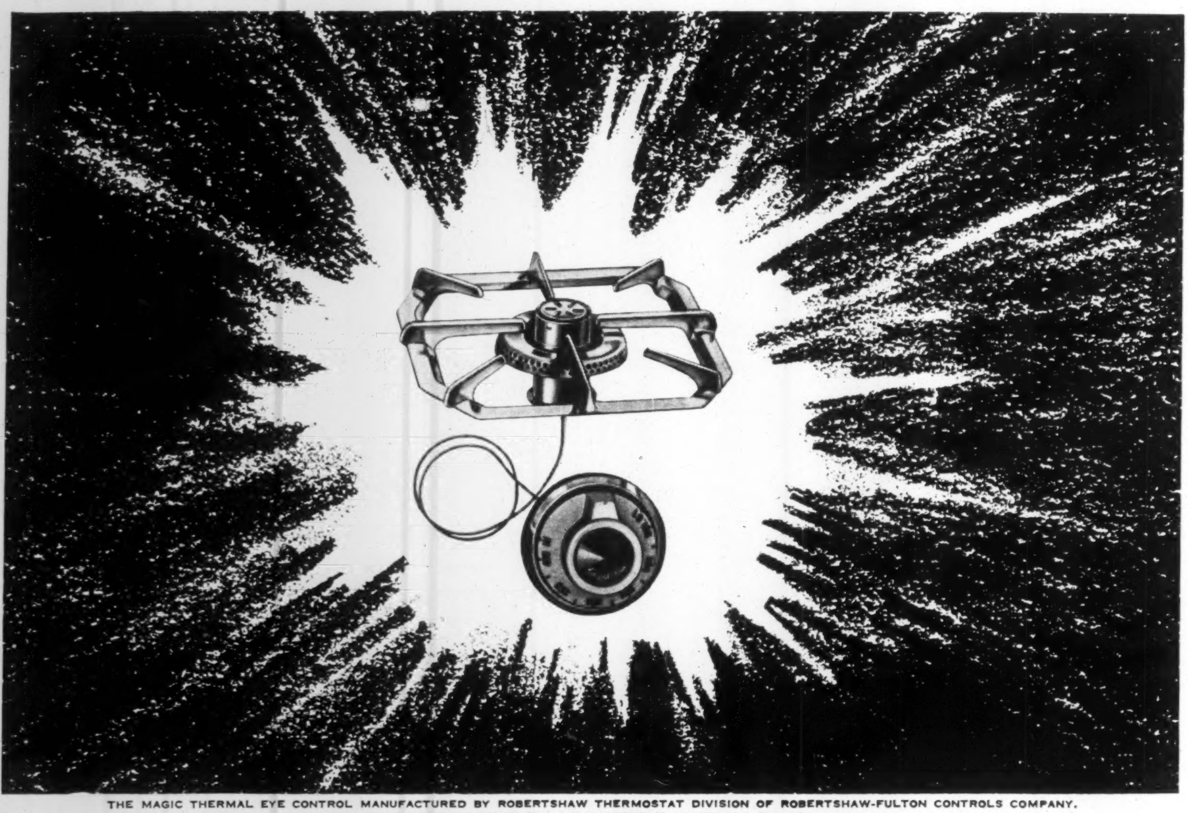
MANUFACTURING ENGINEERS OF
AIR CONDITIONING, HEATING, VENTILATING
AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • EASTERN MFG. DIV., SCRANTON, PA.
TRANE COMPANY OF CANADA, LTD., TORONTO • 90 U.S. AND 19 CANADIAN OFFICES

INDIVIDUAL ROOM UNITS. UniTrane air conditioners solve difficult design and remodelling problems. Select compact floor models (illustrated in Fan-Coil type); space-saving ceiling models; or concealed types for a "built-in" appearance. Induction units as well as fan-coil models provide for filtering *all* the air—not just primary air.

TRANE RECIPROCATING COMPRESSORS stay young years longer, insure lasting client satisfaction! Dependable multi-step capacity control reduces starting and stopping. Designed for easy installation, easy service—more dependable operation. Capacities from 10 to 75 tons; duplex units to 150 tons.





THE MAGIC THERMAL EYE CONTROL MANUFACTURED BY ROBERTSHAW THERMOSTAT DIVISION OF ROBERTSHAW-FULTON CONTROLS COMPANY. IT IS USED ON MORE THAN 40 DIFFERENT HOUSEHOLD RANGES.

Robertshaw Controls "Help The Cook Get off the Hook!"

—With Precision-Controlled Tube by WOLVERINE

Nowadays—thanks to gas and electric thermostatic controls by Robertshaw®—it's difficult for a cook to spoil the broth or ruin the bacon because of overcooking.

Taking the guesswork out of cooking isn't easy—requires, in fact, exceptional precision in the manufacturing of the thermostatic controls. That's why, for example, Robertshaw uses small diameter Wolverine copper tube of rigidly controlled quality for the capillary of its new Thermal Eye® gas control. This highly responsive unit senses the temperature of cooking food and keeps it at a predetermined level—for many hours if necessary.

Precision control in all such instruments, say Robertshaw engineers, depends to a large extent on the built-in precision of the copper tube. This tube contains a temperature sensitive fluid, which by expansion and contraction, regulates the flow of fuel to the burner.

Proof that Wolverine copper tube meets these exacting demands is found in Robertshaw's use of "Miles of Wolverine copper tube each month".

Meeting the specialized demands of individual manufacturers such as Robertshaw is but another facet of Wolverine's continuous Tubemanship program.

When specifying tubing or tubular-shaped parts always remember that, at Wolverine, Tubemanship stands for the perfect blending of experience, research and sound engineering. Make it your "buy" word. Write for Wolverine's General Products Catalog.

CALUMET & HECLA, INC.
- CALUMET DIVISION
- WOLVERINE TUBE DIVISION
- FOREST INDUSTRIES DIVISION
- GOODMAN LUMBER COMPANY
- CALUMET & HECLA OF CANADA LIMITED
- CANADA VULCANIZER AND EQUIPMENT COMPANY LIMITED

WOLVERINE TUBE
Division of Calumet & Hecla, Inc.
1461 CENTRAL AVE. DETROIT 9, MICH.
Manufacturers of Quality Controlled Tubing and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPARTMENT, 13 EAST 40TH STREET, NEW YORK 16, NEW YORK

5791

tt TUBE-TURN TRADE-MARK
6-280
WPB
SCH 40
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View between the two 2250-ton compressors at Garden State Plaza.

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

Piping that helps

AIR CONDITIONING

PAY OFF

● Air conditioning has become a giant industry because it provides valuable *user benefits*...more customers, increased working efficiency, greater profit.

Tube Turns is proud to be associated with this growing business, giving it assistance in piping engineering and supplying the top-quality, welded-piping fittings essential for dependable air conditioning systems.

More than 12,000 TUBE-TURN* products are available from your nearby Tube Turns' Distributor for *all* your needs in welded piping of *all* kinds.

AIR CONDITIONED. Buildings alone for the new Garden State Plaza Shopping Center at Paramus, N. J., cover 10 acres. Two 2250-ton compressors provide for the air conditioning system. All welded piping with TUBE-TURN fittings ranges from 1/2" to 18" diameter. Architect-Engineer: Abbott, Merkt & Co.; General Contractor: Joseph L. Muscarelle; Mechanical Contractor: Frank A. McBride Co.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

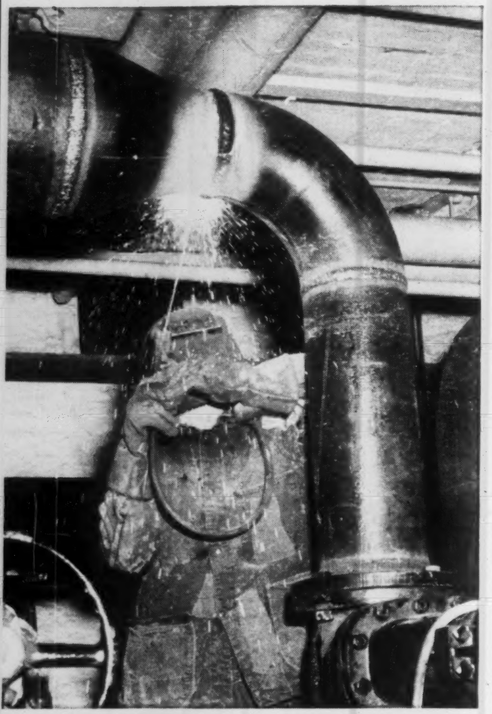
A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Detroit • Atlanta • New Orleans • Houston • Midland
Dallas • Tulsa • Kansas City • Denver • Los Angeles • San Francisco • Seattle
In Canada: Tube Turns of Canada, Ltd., Ridgetown, Ontario • Toronto, Ontario • Edmonton, Alberta

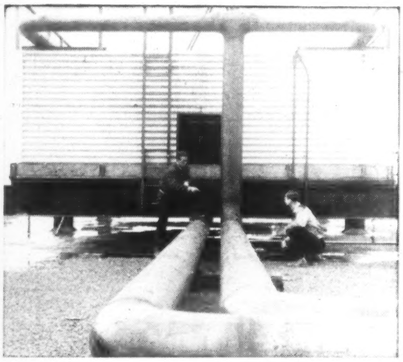
WHY IT PAYS

Why it pays to specify TUBE-TURN® Fittings for

AIR CONDITIONING PIPING



ELIMINATES GUESSWORK. Workers know they are getting the proper fittings as called for on the blueprint because TUBE-TURN fittings are completely and permanently identified as to dimensions, schedule and material.

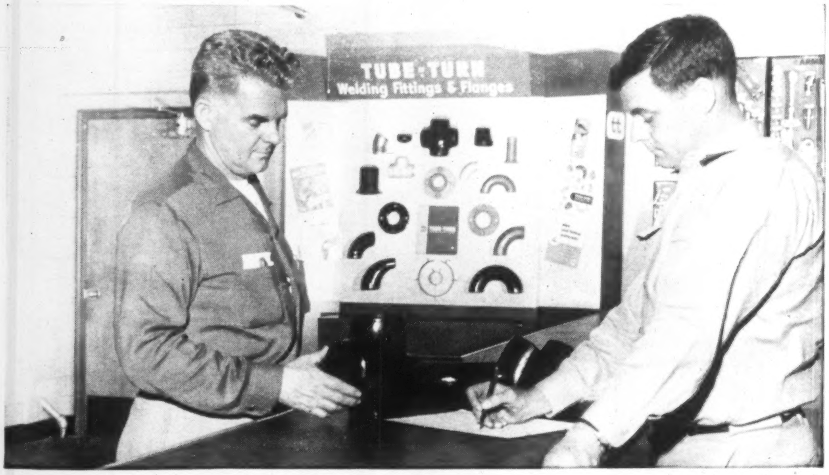


FASTER INSTALLATION. Rigid inspection and quality control insure absolute uniformity of TUBE-TURN products... as to size, circularity and wall thickness. Above: Cooling tower for Bergen-Mall Shopping Center, Paramus, N. J. Photos courtesy Frank A. McBride, Paterson, N. J., mechanical contractors.

FOR SOUND ENGINEERING. You can specify TUBE-TURN* Fittings and Flanges and *know* you'll get the *right* product, without compromise. For example, you can get TUBE-TURN wrought iron fittings such as used for these condenser water lines in State Capitol Building, Harrisburg, Pa. Contractors: Riggs Distler & Co., Inc.

→

CUT RED TAPE. Tube Turns' line includes more than 12,000 standard welding fittings and flanges. All are available promptly from your nearby Tube Turns' Distributor. You can fill all your needs with one order to save purchasing manhours. Photo courtesy McJunkin Corporation, Charleston, W. Va.



HELPFUL DATA—This new Tube Turns' booklet gives helpful information on pipe, fitting and flange materials. Mail the coupon for your free copy.

pipe,
fitting and
flange
materials

TUBE TURNS, Dept. A-5
224 East Broadway, Louisville 1, Kentucky

Company Name ______________________

Company Address ______________________

City ______________ *Zone* ______ *State* ______

Your Name ______________________

Position ______________________

Available now from your nearby TUBE TURNS' Distributor

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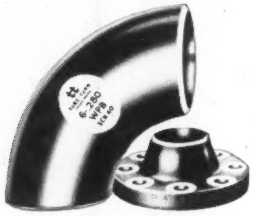
In Canada: Tube Turns of Canada Limited, Ridgetown, Ontario • Toronto, Ont. • Edmonton, Alberta

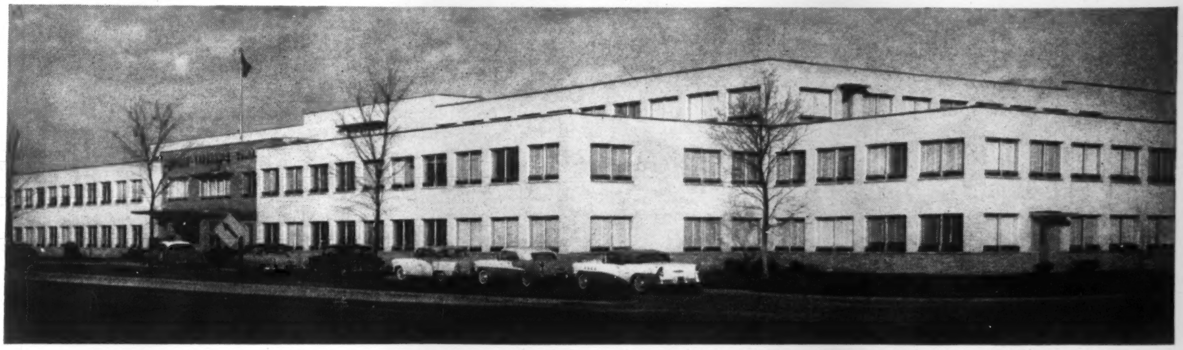


*"TUBE-TURN" and "tt" Reg. U. S. Pat. Off.

TUBE TURNS

LOUISVILLE 1, KENTUCKY
A DIVISION OF NATIONAL CYLINDER GAS COMPANY

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY



National Home Office of the Allstate Insurance Company.

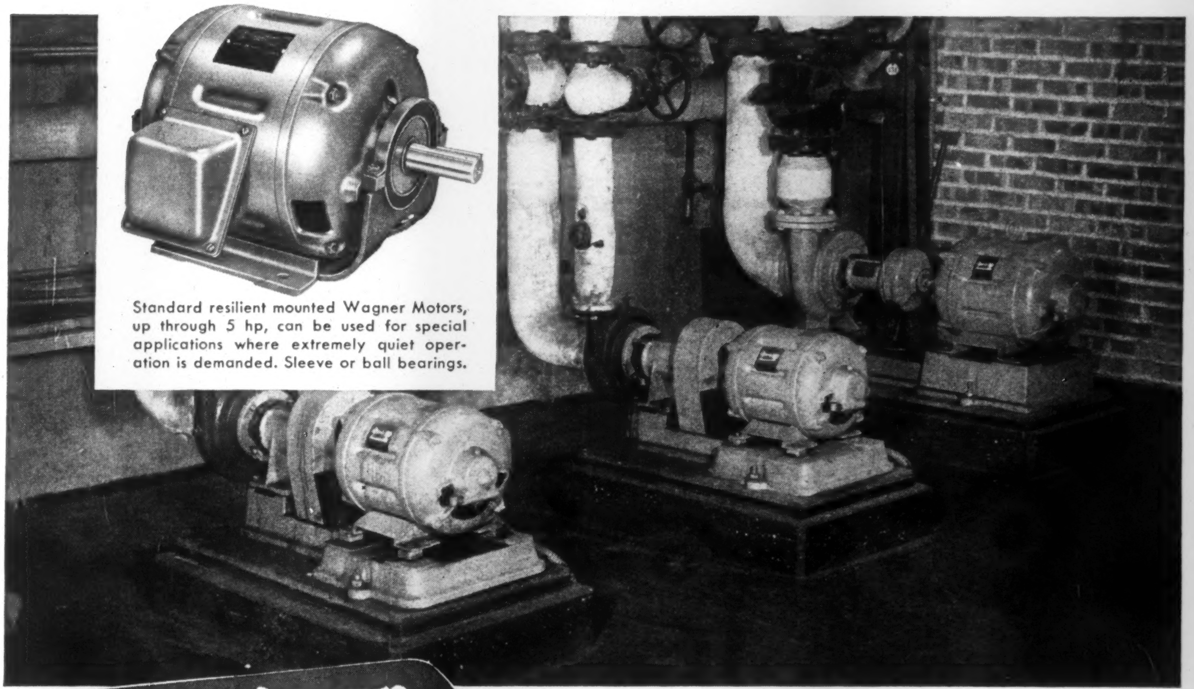
Wagner Motors help B & G Pumps meet their toughest test... QUIET OPERATION!

Circulating pumps used in hot water heating systems must be silent—vibrationless in operation, since they are the connecting links between the boiler room and the structure itself. A prime requirement for quiet pump operation is an electric motor that operates almost silently, yet has plenty of stamina to hold up under years of hard, steady operation.

That's why Bell & Gossett Company used Wagner Motors on the Universal Pumps in the Allstate Insurance Company home office. These quiet-type motors are known for smooth balance and quiet operation.

Perhaps you have a specialized motor application... if so, remember, there's a Wagner motor to fit every need... a complete line for all current specifications with a wide variety of enclosure types and mountings.

Your nearby Wagner engineer can help you select the *right* motor to meet your specifications. Call the nearest of our 32 branch offices or write us.



Standard resilient mounted Wagner Motors, up through 5 hp, can be used for special applications where extremely quiet operation is demanded. Sleeve or ball bearings.

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

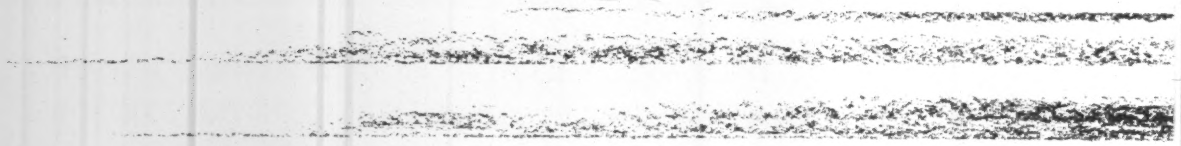
BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

M57-7

"Boy, you sure get faster delivery TUTTLE & BAILEY standard sizes!"

"Yeah, and they save



Our two friends are wise, indeed, and so are the majority of those who specify and install air distribution devices for jobs large or small. From experience they know that when Tuttle & Bailey initiated *standard sizes* (ten years ago!) for grilles, registers and ceiling diffusers it had many real benefits, and still does.

It means that T&B *stocks* standard sizes and that in turn means faster delivery, faster completion of jobs and more satisfied owners. Very important, too, standard sizes are *priced lower!* Incidentally, experience has also proved that T&B standard sizes can meet at least 95% of job requirements.

Use this reference chart of TUTTLE & BAILEY standard sizes

T&B TRI-FLEX supply air grilles and registers

T60	Single deflection grille (vertical face bars)
T64	Double deflection grille (vertical face bars, horizontal rear bars)
T55	Double deflection grille (horizontal face bars, vertical rear bars)
T67	Single deflection register (vertical face bars, vertical damper blades)
T647	Double deflection register (vertical face bars, horizontal rear bars, vertical damper blades)

26 standard sizes

8x4
10x4
10x6
12x4
12x5
12x6
14x4
14x5
14x6
16x5
16x6
20x5
20x6
20x8
24x5
24x6
24x8
24x10
24x12
30x6
30x8
30x10
30x12
36x8
36x10
36x12

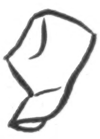
T&B AEROVANE return air grilles and registers

T70D	Grille (horizontal bars)
T78	Register (horizontal face bars, horizontal damper blades)
T88	Register (vertical face bars, horizontal damper blades)

20 standard sizes

10x6
10x8
12x6
12x8
12x12
18x6
18x12
18x18
24x12
24x18
24x24
30x12
30x18
30x24
36x18
36x24
36x30
48x24
48x30
48x36

when you order



you money, too!"

T&B VENTILATING REGISTERS (No. 7908)

23 standard sizes

6x4
8x4
10x4
6x6
8x6
10x6
12x6
18x6
8x8
10x8
12x8
14x8
16x8
18x8
10x10
12x10
12x12
18x12
24x12
14x14
16x16
18x18
24x24

T&B AEROFUSE CEILING DIFFUSERS

	Standard Sizes *(supply duct dia. = listed size in inches)*
Adjustable Pattern	
Type PA	6-8-10-12-14-16-18
Fixed Pattern	
Type PS, stepped down	6-8-10-12-14-16-18
Type PF, flush	6-8-10-12-14-16-18
Type PR, supply and return	6-8-10-12-14-16-18
Type PH, half-round	6-8-10-12-14-16
Type D, square	6-8-10-12
Type ES, stepped down	6-8-10-12-15-18-22
Type S, flush	6-8-10-12-15-18-21

Dampers, grids and other accessory equipment available in standard sizes for use with the above Aerofuse Ceiling Diffusers.

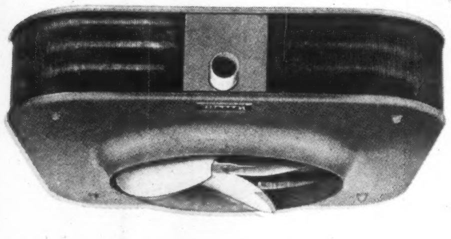
I'd suggest . . .
get in touch with your nearest Tuttle & Bailey Representative and discuss with him *T&B standard sizes.* See for yourself how they can help you get your next job completed faster . . . and save you money, too.

TUTTLE & BAILEY

division of Allied Thermal Corp. T & B New Britain, Connecticut

Propeller Fan Unit Heaters

Continuous-tube heating elements for steam or hot water; rear pipe connections permit maximum headroom; styled for modern interiors; gray-green baked enamel.



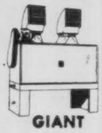
Little Giant Unit Heaters

Wrap-around universal heating elements; end pipe connections, motor removes from below, permit close-to-ceiling mounting; wide variety air-deflector attachments for vertical or horizontal discharge.

DOUBLE BARRELLED

The contractor who goes hunting for business armed with Nesbitt products brings home the profit! For instance, take these two companion lines: Nesbitt Propeller Fan Unit Heaters (24 models, 15,200 to 335,000 Btu/hr) and Nesbitt Little Giants (propeller fan units with blower fan performance; 34 models, 34,000 to 684,000 Btu/hr). They supplement each other to cover the whole range of propeller fan applications. With these two lines you are well armed—"double barrelled"—for selectivity and performance; ease of installation and economy; horizontal or vertical discharge; suspended or close-to-ceiling mounting; and (because of universal heating elements) for steam or hot water. And both lines are dependable—the capacities and sound ratings of every model have been tested in accordance with codes adopted by the ASHAE and the AMCA, Inc. For happy hunting, get to know these two lines better: send for Nesbitt Publication 412.

to cover the whole range of propeller fan unit heater applications

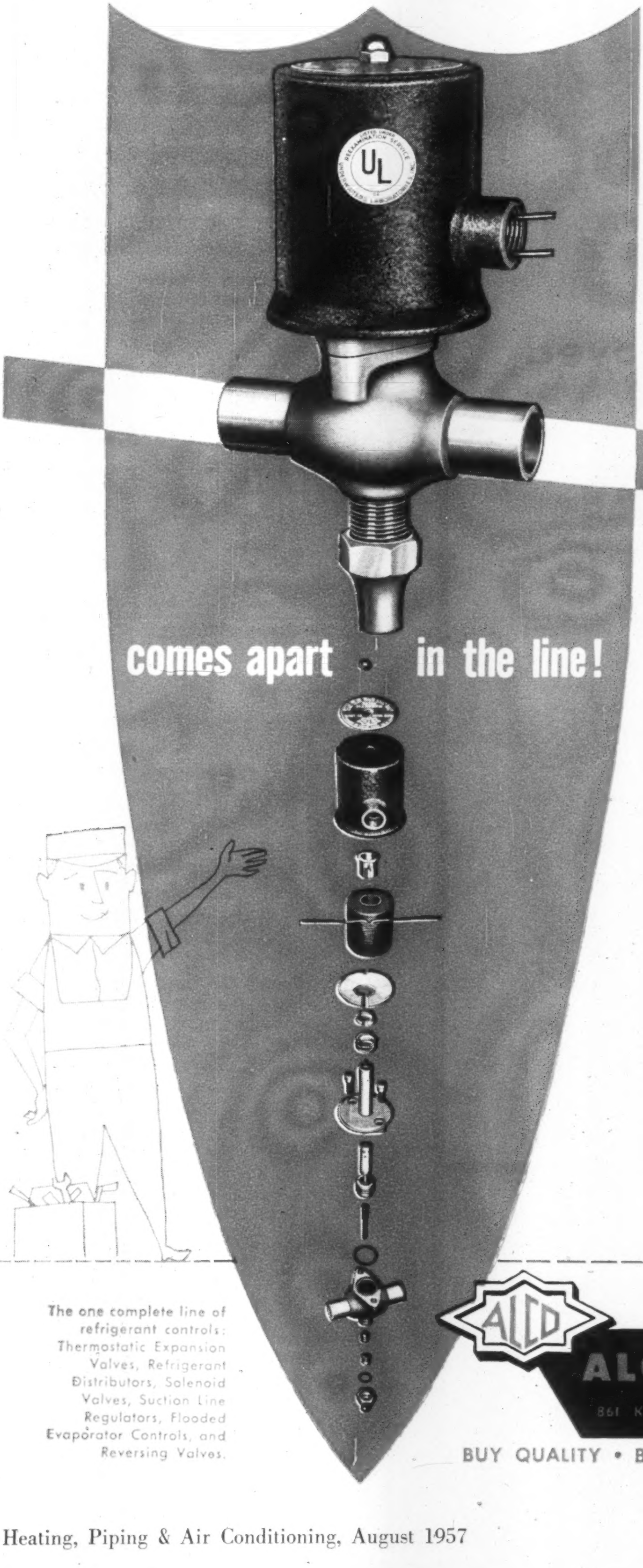


GIANT

Nesbitt *The name to go buy in* **UNIT HEATERS**

CABINET

BACKED BY 40 SUCCESSFUL YEARS—MADE AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PA.



guard against call-backs... install Alco solenoid valves

Alco Solenoid Valves are rigidly tested to assure you of one-trip installation, long trouble-free service and a minimum of maintenance. Alco is your best choice for any solenoid application.

1 — Compact size, easy to install.

2 — Comes apart quickly for inspection, cleaning and service — without breaking electrical or line connections.

3 — Cool, high-powered coil built by Alco of finest materials, under strict quality control.

4 — Coil impregnated 3 times, baked a total of 18 hours by Alco for triple protection against moisture and burn-out.

5 — Only two working parts, of corrosion-resistant stainless steel.

6 — Kick-off spring for positive closing. Bubble-tested seating for positive shut-off.

7 — Body of highest-quality brass, in wide variety of styles and connections, to save you installation time.

8 — Manual operating stem in case of power failure.

The one complete line of refrigerant controls: Thermostatic Expansion Valves, Refrigerant Distributors, Solenoid Valves, Suction Line Regulators, Flooded Evaporator Controls, and Reversing Valves.

ALCO

ALCO VALVE CO.
861 KINGSLAND AVE. • ST. LOUIS 5, MO.

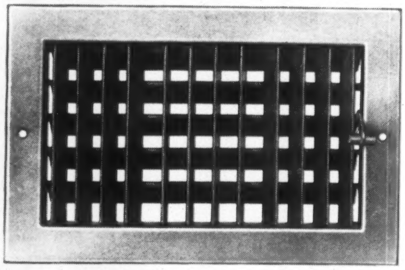
7598

BUY QUALITY • BUY ALCO

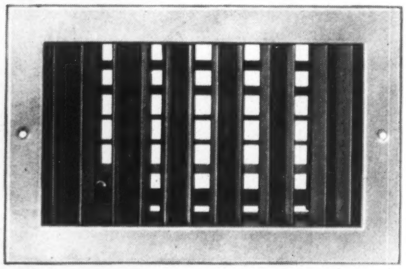
SEE YOUR ALCO WHOLESALER

All
WATERLOO
Registers and
Grilles are
tested and approved
by
ANEMOSTAT®
Laboratories

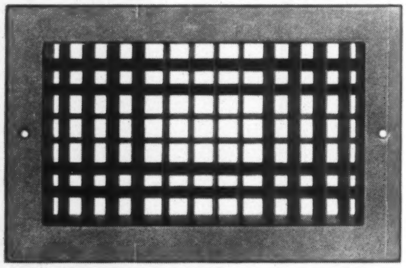
TESTED · APPROVED · ANEMOSTAT CORPORATION OF AMERICA



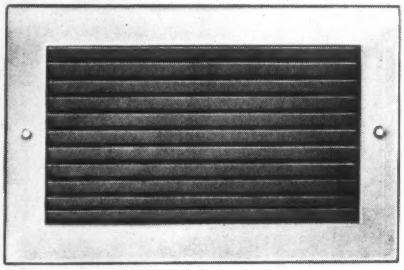
Style 1VMH Supply Register
One set adjustable vertical louvres with multi-shutter damper, horizontal blades.



Style 2VO Supply Register
Two sets of adjustable louvres, front vertical, second horizontal with opposed damper, vertical blades.



Style 2V Supply Grille
Two sets of adjustable louvres, front vertical, rear horizontal.



Style 3H Return Air Grille
One set of horizontal fins fixed down at 45° deflection . . . Also available in 0° deflection.

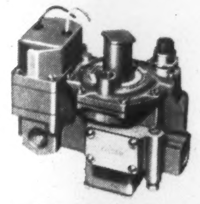
Write for Waterloo Catalog, containing complete data.

WATERLOO
REGISTER CO., INC.
WATERLOO, IOWA

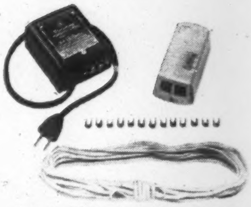
WR-101

REGISTERS • GRILLES • VOLUME CONTROL DAMPERS • DOOR VENTILATORS

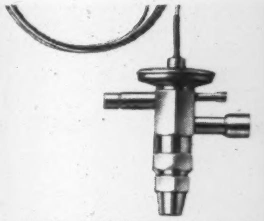
One reliable source for all heating and air conditioning controls — another service of Controls Company of America.



Series 5250 gas furnace control features a flow interrupter for summer shutdown. Built-in pressure regulator — easy conversion to LP-gas. Choice of outlets. Complete with electro-magnetic operator. Simple installation.



Series 2700 Flexatemp thermostatic control — converts any standard manually operated, A-P constant-level oil valve to fully automatic, wall-thermostat control. Complete kit. Choice of thermostats. For heaters and furnaces.



Model 214 thermostatic expansion valve — for all types of air conditioning and coolers. Accurate modulation assures extremely smooth valve operation. Sizes: 1, 2, 3 tons R-12; 1, 2, 3, 5 tons R-22. Adjustable superheat.

The trend is Ap

the automatic controls most often seen on the newest best-sellers

The appliance manufacturers have let A-P automatic controls help them sell the many wonderful new heating and air conditioning appliances that improve modern living. More and more firms are standardizing on A-P as a "one-stop" source.

You as a dealer and installer benefit from this simplified procurement. You choose from a *broad range* of oil, gas and refrigeration controls with *uniform quality* standards. You're backed by *nation-wide service* . . . more than 400 refrigeration jobbers can fill orders for future replacements. And it's all yours at *mass-production pricing*. Profit from the trend to A-P!

WRITE FOR FULL DETAILS

on A-P's complete line of standard controls for all types of oil and gas heating and refrigeration. New condensed catalogs provide complete specs.

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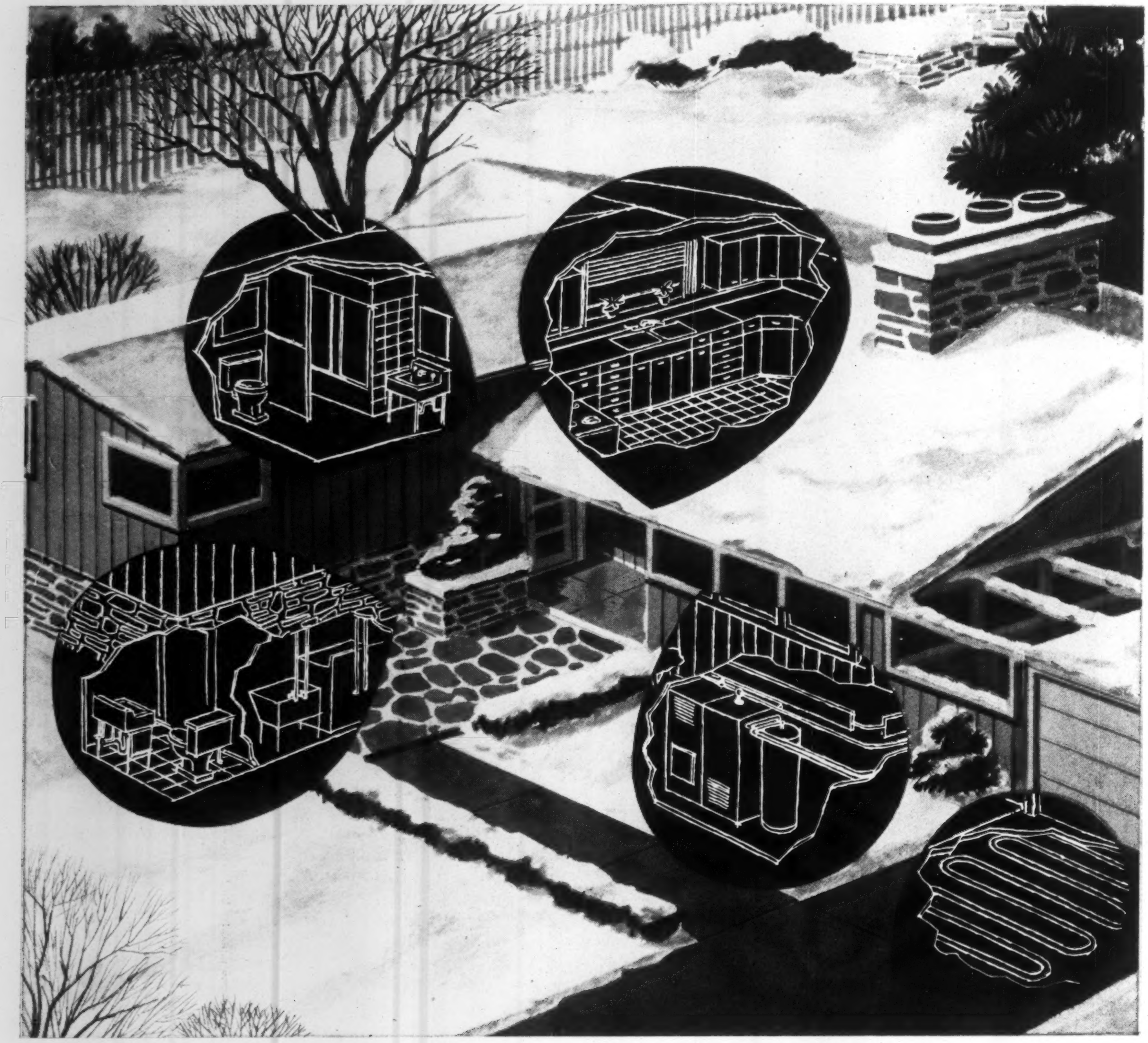
VALVES
FILTERS
DRIERS

CC **CONTROLS COMPANY OF AMERICA**

Manufacturers of A-P CONTROLS

2416 N. 32nd Street • Milwaukee 10, Wisconsin

Controls That Make Modern Living Possible



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Jones & Laughlin is one of the world's principal suppliers of tubular products of highest serviceability. J&L controls *quality* all the way from raw materials through the finishing mills. Whenever you need superior pipe and dependable service, call your nearby J&L distributor. Or write to the Jones & Laughlin Steel Corporation, Dept. 519, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

STEEL

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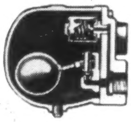
SARCO HEATING SPECIALTIES—a complete line

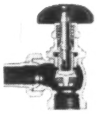
Float Thermostatic Steam Traps



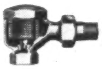
Inverted Bucket Steam Traps

Thermodynamic Steam Traps

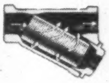
Radiator Valves



Radiator Traps

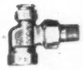


Strainers



Air Eliminators

Balancing Fittings



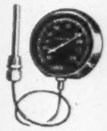
Lift Traps

Motor Valves

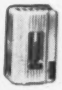
Temperature Regulators

Water Blenders

Dial Thermometers



Room Thermostats



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SARCO and SARCOTHERM

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SARCOTHERM WEATHER-COMPENSATED CONTROL SYSTEMS

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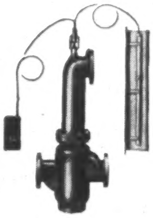
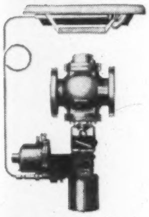
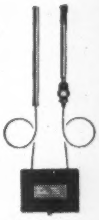


Modulating Controls for hot water and radiant heating



Modulating Controls for steam heating

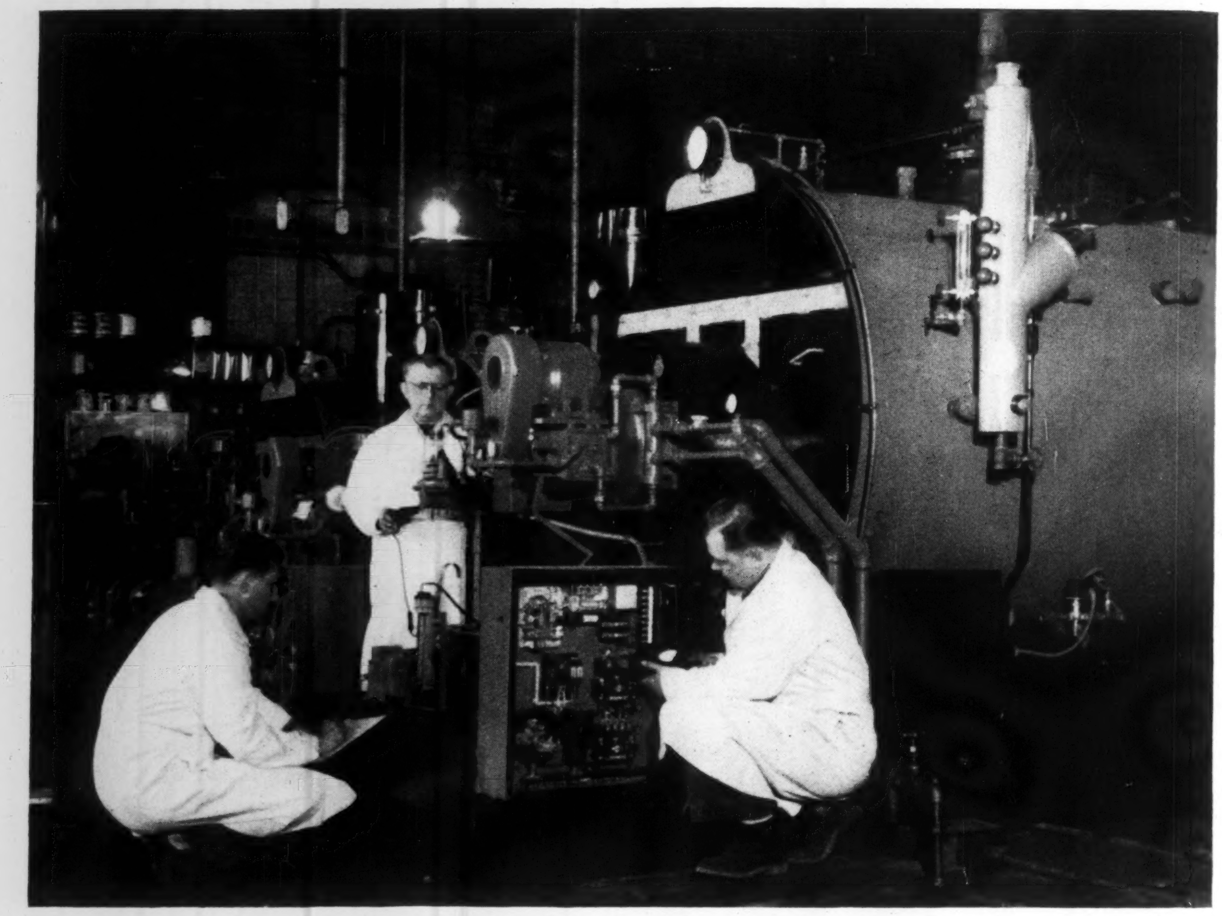


Type AO Controls for hot water and radiant heating

SARCOfIN

finned-tube and baseboard radiation

2132-B



factory fire testing . . .

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When specifications call for "all equipment installed and left in first class operating condition", it pays to install Superior Steam Generators. Fully integrated units including boiler, burner and controls, with all interconnecting piping and wiring completed at the factory, Superior Steam Generators are ready to go to work as soon as tied in to steam, water, fuel and electric lines.

And there are no "bugs" in Superior Steam Generators. Completely fire tested at the factory before shipment, and started on the job by a factory trained expert, they are your best assurance of a clean, trouble-free installation. For complete details on sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water, write today for Bulletin 804F.

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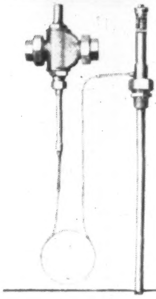
SUPERIOR
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

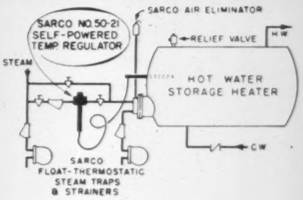
Low-cost Temperature Control —by SARCO
Self-Powered and Electric Indicating



Sarco Temperature Controllers Self-Powered . . . Fully Modulating

Simple as ABC . . . a thermostat with capillary tubing and a valve. That's all! Operated by liquid expansion. Automatic. Self-powered . . . no electricity or compressed air required. Self-contained . . . no exposed mechanism. Packless valve . . . no stuffing box to leak or stick. Easy to install by any pipefitter.

Furnished with thermostats suitable for any liquid or for air in dryers, ovens, air ducts, etc. Valve sizes . . . ½ to 6″. Temperature ranges to 300°F. *Bulletin 620-2.*

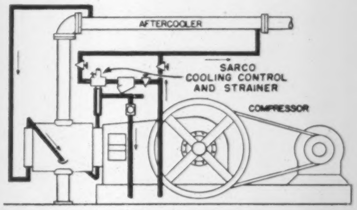

SARCO NO.50-21 SELF-POWERED TEMP. REGULATOR
SARCO AIR ELIMINATOR
RELIEF VALVE
HW
STEAM
HOT WATER STORAGE HEATER
CW
SARCO FLOAT-THERMOSTATIC STEAM TRAPS & STRAINERS

Typical applications: Shell and tube heat exchangers; condensers, oil storage tanks, dryers, etc.

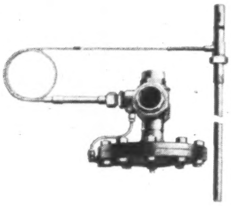
Sarco Cooling Controls Self-Powered . . . Fully Modulating

Simple, compact, automatic thermostatic valve. Eliminates overcooling and undercooling. Saves water. Overall height of ¾″ size is only 17 7/16″. Self-powered . . . requires no electrical or compressed air hook-up. Valve and bulb all in one unit. No exposed mechanism. Single-seated packless valve . . . not affected by silt or scale-forming minerals.

Valve sizes . . . ⅜ to 1½″. Temperature ranges between 40° and 210°F. *Bulletin No. 710-B.*


AFTERCOOLER
SARCO COOLING CONTROL AND STRAINER
COMPRESSOR

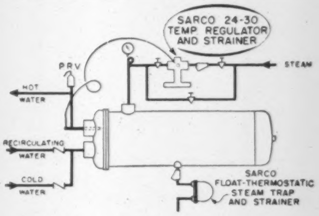
Typical applications: compressors, small engines, water-cooled bearings, condensers, dry cleaning stills, etc.



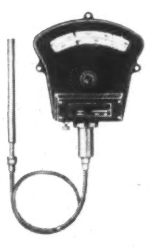
Sarco Temperature Controllers Self-Powered . . . Single-Seated, Tight-Closing

A simple, self-powered automatic temperature controller with diaphragm-operated, pilot-controlled valve. Designed for intermittent service or service involving long periods with practically no call for steam. Self-powered by liquid expansion . . . no electricity or compressed air needed. Packless.

Valve sizes . . . ½ to 3″. Temperature ranges to 300°F. *Bulletin No. 625-B.*


SARCO 24-30 TEMP. REGULATOR AND STRAINER
PRV
STEAM
HOT WATER
RECIRCULATING WATER
COLD WATER
SARCO FLOAT-THERMOSTATIC STEAM TRAP AND STRAINER

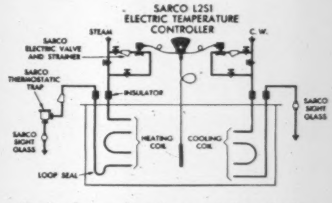
Typical applications: instantaneous heaters, fuel oil pre-heaters, high pressure applications on hot water storage tanks.



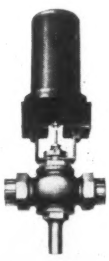
Sarco Electric Temperature Controllers Indicating Type

Simple, inexpensive, electric-indicating automatic temperature controller. Sensitive enough to perform many of the functions of much more elaborate recorder-controllers, at a fraction of their cost. Responds to changes of ± ½°F. Adjustable. Large, easy-to-read scale shows both actual and set temperatures.

Temperature ranges between minus 90° and plus 650°F. Offers many sequence combinations such as step-heating. *Bulletin 1025-B.*


SARCO L2S1 ELECTRIC TEMPERATURE CONTROLLER
STEAM
C.W.
SARCO ELECTRIC VALVE AND STRAINER
SARCO THERMOSTATIC TRAP
INSULATOR
SARCO SIGHT GLASS
HEATING COIL
COOLING COIL
LOOP SEAL
SARCO SIGHT GLASS

Typical applications: plating tanks, processing vats, kettles, chemical tanks, etc.



Sarcostat Hydraulic Motor Valves Electrically Operated

For remote control by hand or thermostat. Open and shut operation. Can be equipped with semi-modulating mechanism. Powerful hydraulic action operates valves up to 5″ single-seated, or 8″ double-seated, at pressures up to 175 psi. Ruggedly constructed . . . to withstand severe use without constant supervision and with minimum maintenance. Operates in any position.

For direct connection to 110 volts A. C., 60 cycle current. Valve sizes . . . ½ to 5″ single-seated; ½ to 6″ double-seated. *Bulletin 1080-A.*

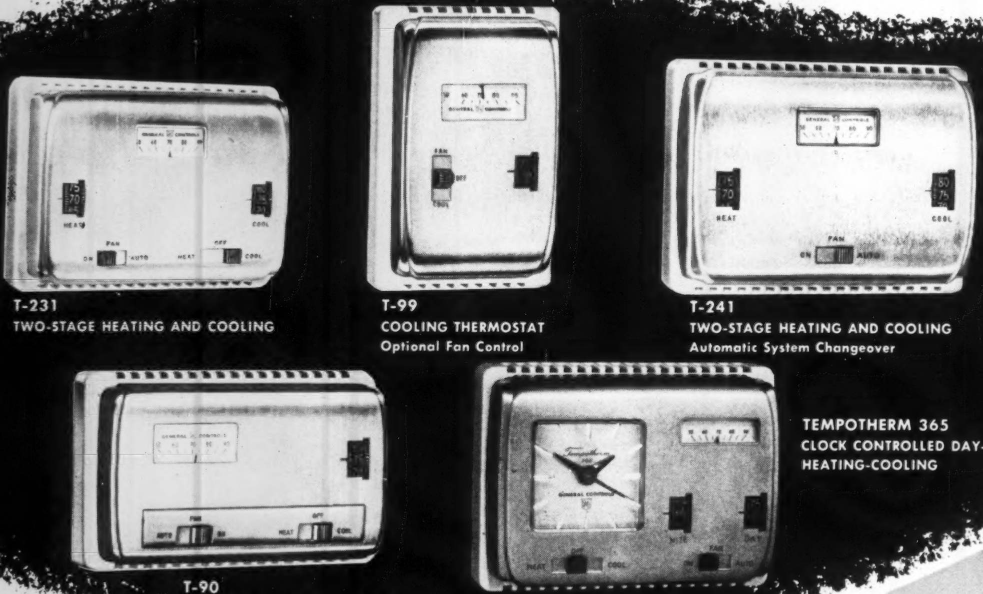
UNDIVIDED RESPONSIBILITY

From one "Complete Line" source . . . SARCO-SARCOTHERM . . . for temperature controllers, steam traps and other heating specialties.

2230-B

Write for Bulletins to—**Sarco Co., Inc., Empire State Bldg., New York 1, N.Y.**

ALL WITH MODERN MERCURY SWITCH DEPENDABILITY...



T-231
TWO-STAGE HEATING AND COOLING

T-99
COOLING THERMOSTAT
Optional Fan Control

T-241
TWO-STAGE HEATING AND COOLING
Automatic System Changeover

T-90
YEAR 'ROUND HEATING-COOLING

TEMPOTHERM 365
CLOCK CONTROLLED DAY-NITE,
HEATING-COOLING

AMERICA'S MOST COMPLETE LINE OF AIR CONDITIONING THERMOSTATS!

118 FUNCTION VARIATIONS TO CONTROL ANY SYSTEM

- COOL, HEAT, FAN, AUTO, OFF, RESET SWITCHING FUNCTIONS
- SINGLE OR TWO-STAGE HEATING WITH SINGLE OR TWO-STAGE COOLING
- HEAT AND COLD ANTICIPATION
- DAY AND NITE CLOCK PROGRAMMING
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For control of gas, oil, coal, electricity refrigeration, evaporative, chilled water and heat pump systems.

General Controls continues to set the pace in creating the kind of *advanced design* thermostats that afford the systems engineer maximum selectivity in air conditioning thermostats. Not only do General Controls thermostats please the homeowner by their beauty and simplicity of line, they also signify *quality* — and prove it by delivering the top performance engineered into systems and related equipment.

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You design it . . . we'll control it . . . *automatically.*

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America's Finest Automatic Controls for Home, Industry, and the Military
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Ingersoll-Rand Motorpumps — designed specifically for air conditioning service — are compact to save space, and operate in any position to assure easy installation. These rugged pumps are in operation in many thousands of varied installations — providing important savings through high operating efficiency with minimum maintenance.

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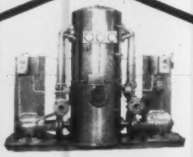
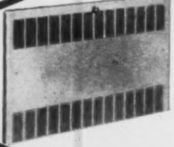
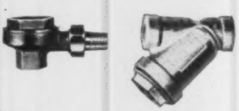
All Pumps, Convectors and Steam Specialties by DUNHAM-BUSH

ON THIS NATKIN & COMPANY HEATING JOB







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NATKIN & COMPANY	MAGUOLO & QUICK	HARRY F. WILSON
St. Louis, Missouri	St. Louis, Missouri	St. Louis, Missouri
Heating Contractor	Architect	Consulting Engineer

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- VRDA15 Duplex Vacuum Pump
- CH2030 Duplex Condensation Pump
- CH3030 Duplex Condensation Pump
- CH5030 Duplex Condensation Pump

CONVECTORS
by Dunham-Bush
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STEAM SPECIALTIES
by Dunham-Bush
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Plus Multi-Speed UNIT HEATERS
by Dunham-Bush.

Every day . . . Dunham-Bush "one source—one responsibility" . . . makes more sense to more people who specify and install heating equipment.

At the Cardinal Glennon Memorial Hospital for Children in St. Louis, for example, you'll find *all* pumps, *all* specialties, *all* convectors are by Dunham-Bush.

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America Looks to DUNHAM-BUSH *for Modern Heating*

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Henry Abso-Dry®

Pressure Sealed Driers

U. S. Patent No. 2283989

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PRESSURE SEALED
DRIER
V612 - 3/8
350 psi, max. w.p.
ABSO-DRY® PRESSURE SEALED DRIER
HENRY VALVE CO.
CONTROLLING FLOW SINCE 1914
U. S. PATENT No. 2283989

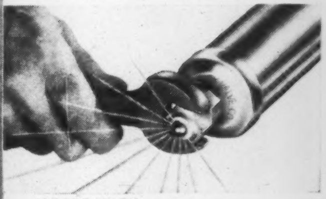
Only a HENRY DRIER proves its dryness with a Hiss©

To obtain maximum drying efficiency, Henry thoroughly reactivates each drier and, by an exclusive, patented process of manufacture, provides positive indication, by pressure sealing, that the drier is tight, dry, and factory-fresh on reaching the user.

Complete Size Range—*The complete range of types, capacities, and connection sizes permits the selection of the proper Henry drier for any installation.*

STOCKED AND SOLD BY LEADING JOBBERS.

*"They Hiss and Tell"**



***TRADE-MARK**
When the end connection seal of a new Henry drier is loosened prior to installation, there is a hissing sound due to the escape of dehydrated air.

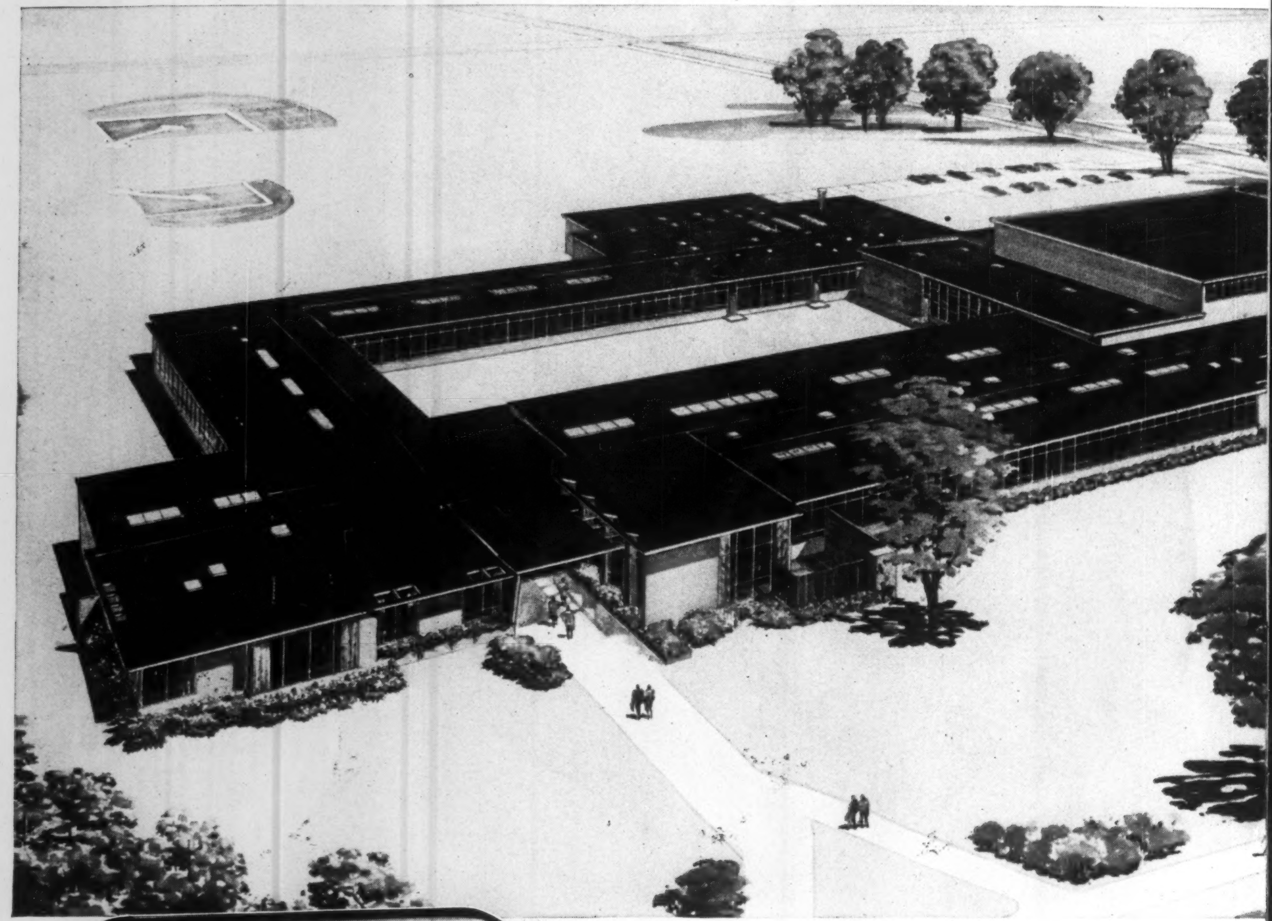
HENRY VALVE CO.

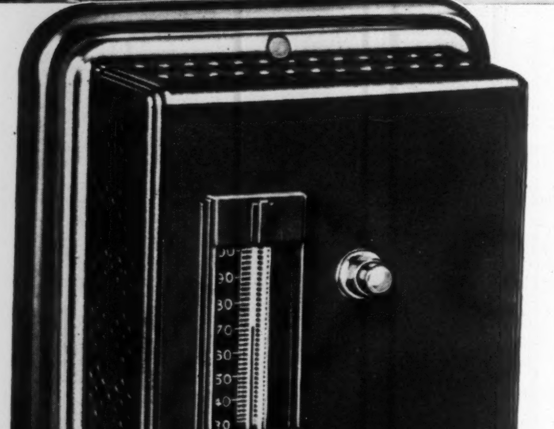
MELROSE PARK, ILLINOIS (Chicago Suburb)
Cable: Hevalco, Melrose Park, Illinois

VALVES, DRIERS, STRAINERS, AND ACCESSORIES FOR REFRIGERATION, AIR CONDITIONING AND INDUSTRIAL APPLICATIONS

LISTED BY UNDERWRITERS' LABORATORIES, INC. UNDER RE-EXAMINATION SERVICE FOR WORKING PRESSURES OF 350 P.S.I. AND 500 P.S.I.

The Right Temperature for





**Springfield High School, Springfield, Michigan. Guido A. Binda and Associates, architects, Battle Creek; T. Marvin Sahlin, mechanical engineer, Benton Harbor; Miller Davis Company, general contractor, Kalamazoo; Hunter-Prell Company, heating contractor, Battle Creek.*

Johnson *Dual* Thermostats are the practical solution to modern school heating problems where after-hours activities, such as basketball games, dramatic presentations, meetings and other events, require heating for special areas of the building.

With Johnson *Dual* Thermostats in each room of the building, any room can be heated individually without disturbing lower nighttime economy settings of other rooms during these evening activities. Johnson *Dual* Thermostats add tremendously to operating economy while providing the finest in temperature regulation.

Every School Activity...

With
JOHNSON PNEUMATIC TEMPERATURE CONTROL

Modern school designers the country over find that Johnson Pneumatic Temperature Control pays off in lower heating costs . . . system-wide simplicity of operation and upkeep . . . and complete flexibility of control to meet a wide range of school temperature needs.

With a Johnson Thermostat on the wall of every classroom, individual room temperatures can be maintained throughout the day to assure student comfort and alertness regardless of varying room occupancy levels or changing outdoor weather conditions.

In the new Springfield High School*, Springfield, Michigan, a system of Johnson Pneumatic Control offers precise control of both heat and ventilation to satisfy every day and nighttime need. The Johnson *Dual* Thermostats are automatically reset, on a predetermined 7-day schedule, to operate at low, economy temperatures when the building is unoccupied. If the gym, a classroom or two or an office is in use outside of regular school hours, a push of the button on any room's *Dual* Thermostat restores it to the daytime comfort level *without changing the economy settings of the other thermostats in the building.*

Johnson Pneumatic Control operates all of the building's heating and ventilating equipment to provide maximum operating economies. The simplicity and flexibility of the Johnson System answers every room temperature requirement.

It's easy to investigate the unmatched advantages of a Johnson Pneumatic Temperature Control System. An engineer from a nearby Johnson branch office will gladly discuss with you, your architect or consulting engineer the many ways in which Johnson can solve your temperature control problems. Johnson Service Company, Milwaukee 1, Wisconsin. Direct Branch Offices in Principal Cities.

The special after-hours comfort requirements of the gymnasium are easily handled by the Johnson Control System. With Johnson Dual Thermostats, the gymnasium can be economically heated and ventilated independently of other sections of the building to save fuel.

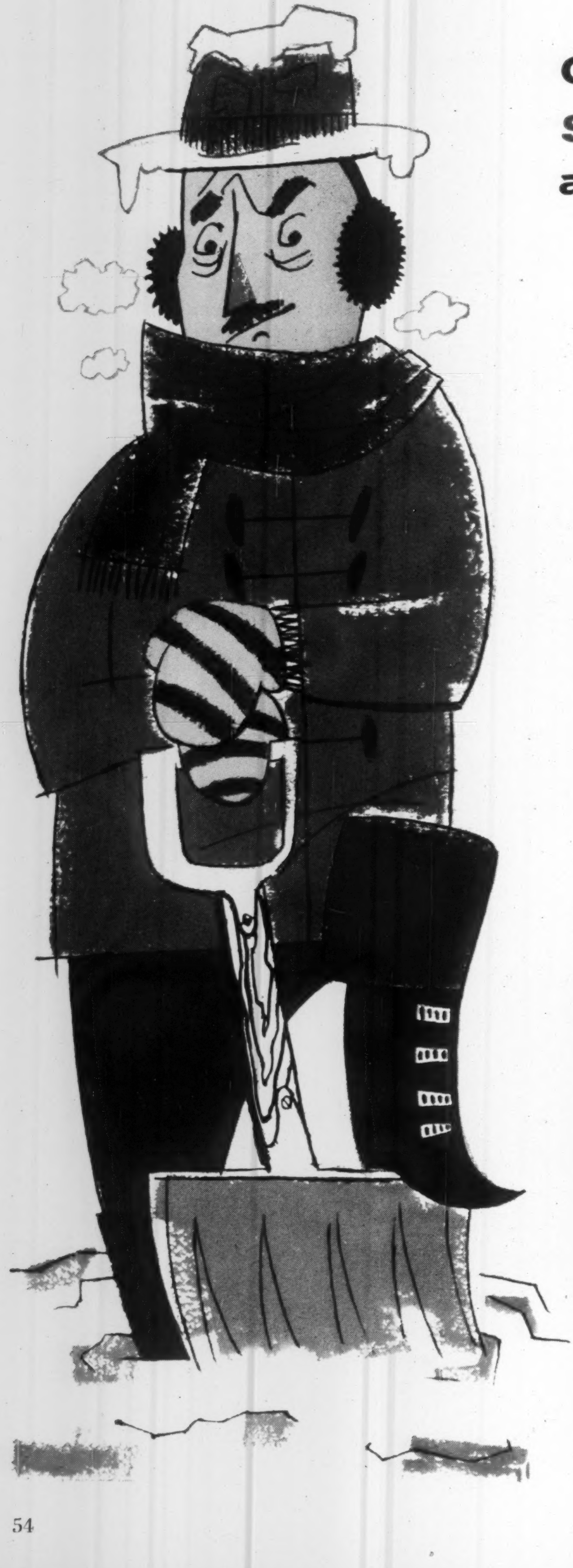
In science rooms the study pattern may include use of heat developing equipment which could create discomfort. Here, again, the thermostat on the wall automatically adjusts heat output and insures proper ventilation for maximum comfort.

In some rooms cooling, rather than heating, is often needed even in the coldest weather. Sensitive Johnson Dual Thermostats easily solve this problem by increasing the volume of outdoor air used for ventilation and reducing the heat output.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885



Get your customers STEAMED UP about snow melting!

Here's a hot solution to a chilly problem: A Spang CW Steel Pipe automatic snow melting system!

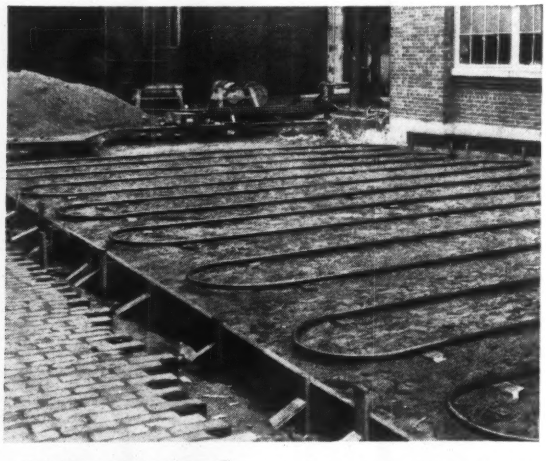
There's nothing like making your plans now to sell a lot of Spang CW Steel Pipe snow melting systems in your area—and getting them installed during the early autumn ahead of the bad weather.

There are plenty of good reasons why your customers need snow melting systems—easy access to store sales rooms or loading docks regardless of weather . . . elimination of expensive snow-removal equipment and chemicals . . . accident reduction . . . goodwill building . . . savings in time and money.

COLD FACTS ABOUT SPANG PIPE

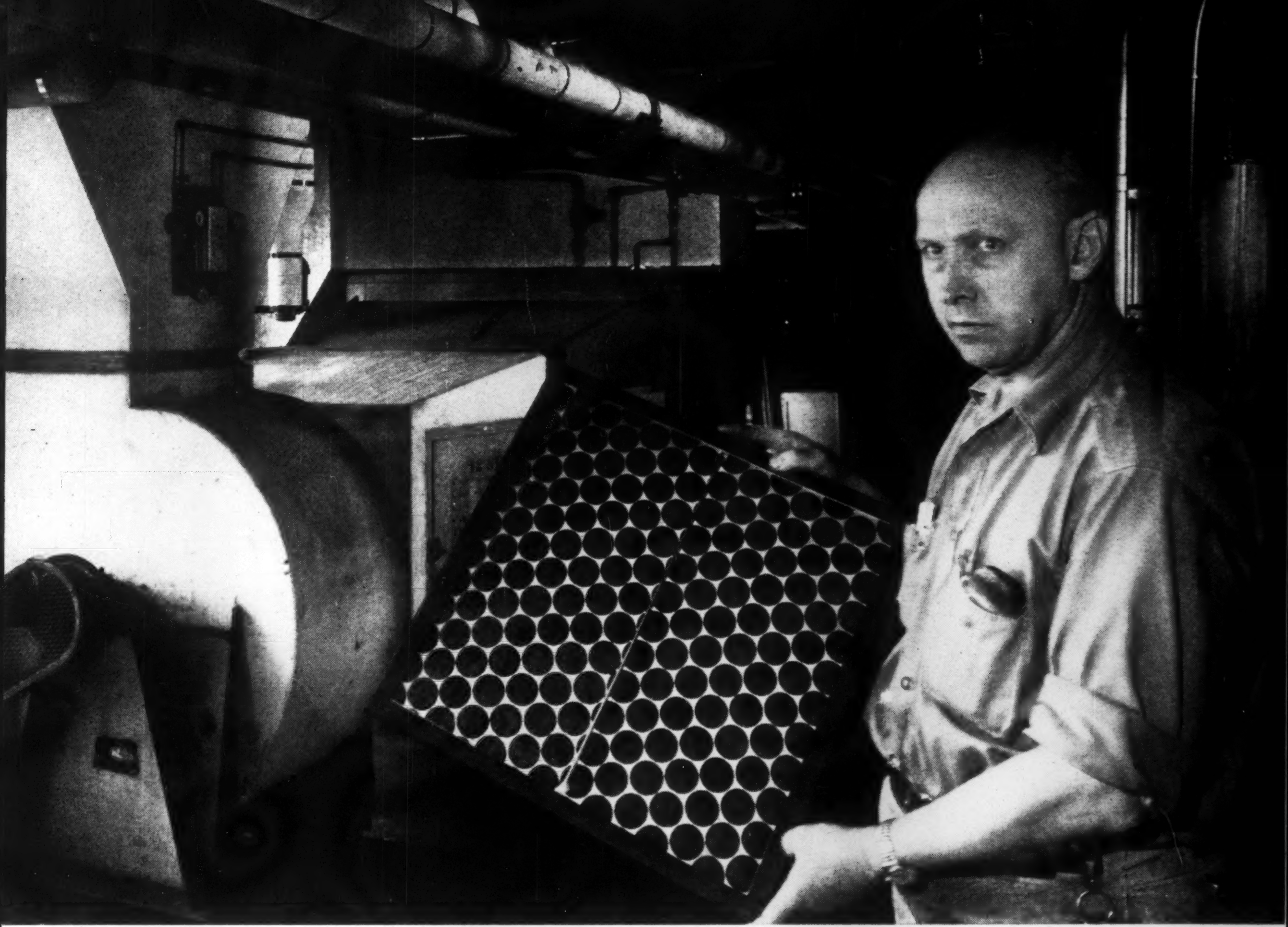
There are plenty of good reasons, too, for using Spang Pipe. Because it is carefully controlled during manufacturing, Spang CW Steel Pipe is uniform, easy to cut, bend, thread and weld. Installations are made quickly, costs are kept low. Thorough inspection and testing before shipment mean you get only *top-quality* pipe, ideal for snow melting installations. This means profits for you!

WARM UP YOUR PROSPECTS with a copy of the free booklet entitled "Snow Melting Systems." Your regional Spang Sales Office can obtain them for you. Order as many as you can use . . . use as many as you order. Start selling now!



SPANG®
CW STEEL PIPE

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Offices:
Two Gateway Center, Pittsburgh, Pa.
District Sales Offices: Atlanta, Boston, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis



This internationally-known research institute uses 1900 Glasfloss Fiber Glass Air Filters every three months to prevent dust build-up in electrostatic precipitators. Perfect atmosphere is needed to assure proper results in the many phases of research tests.

Glasfloss Air Filters help control atmosphere, lower air conditioning costs at world-famous research institute

More than 1900 Pittsburgh Glasfloss Air Filters are used every three months in the air conditioning system at this famous eastern research center to prevent dust build-up on electrostatic precipitators.

"Pittsburgh Glasfloss Filters help catch dust, prevent over-loading the electrostatic precipitators, lower maintenance costs through reduction of the number of times necessary for cleaning or flushing, and lessen the power load," reports the institute's director of engineering.

"Perfect air conditioning is a must at the institute, since we are devoted to long-range research of the effects of industrial techniques upon human welfare. We must control the atmosphere in order not to interfere with results of study on such subjects as air pollution, public health, sanitation and alleviation of industrial hazards. The fact that Pittsburgh Glasfloss Air Filters are constantly used in our air conditioning system speaks for itself."

GLASFLOSS FILTERS CAN GIVE YOU TOP SERVICE, TOO!

Pittsburgh Glasfloss Air Filters are made from fine, soft fiber glass which provides a greater, more efficient dust-collecting area, yet does not interrupt the flow of air. Glasfloss Filters are soft and easy to handle; this fiber glass does not splinter or pierce the skin.

Get top results from your heating and air conditioning systems with Glasfloss Filters. Try them once, and you'll buy them always! For the name of your local Glasfloss Distributor, call your nearest sales office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

PITTSBURGH GLASFLOSS FILTERS ARE A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

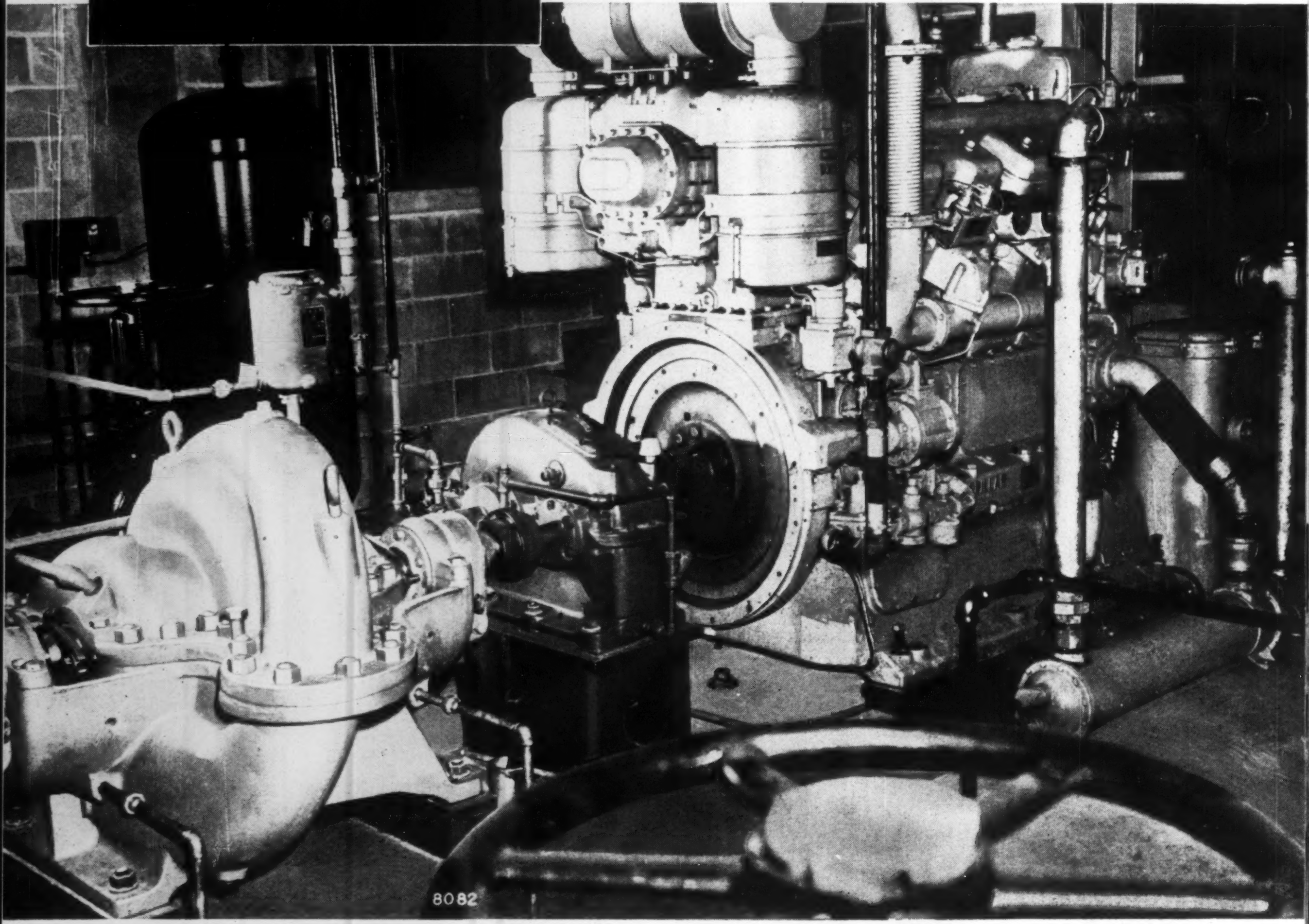
FIBER PPG GLASS

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

DE LAVAL
TWO-STAGE
CENTRIFUGAL PUMPS

boost pressure at peak loads in Port Washington, New York



This De Laval two-stage horizontal split-case pump is one of a pair used to boost pressure during peak hours in the Port Washington, New York water works. Taking water from a large underground storage tank, these De Laval units maintain pressure throughout the system. The dependable centrifugal pumps are powered by Caterpillar diesels with speed increasers; they deliver 1500 gpm at 400 feet tdh with 15 feet lift requiring 185 bhp.

De Laval 2IS-2KS pumps are designed with • back-to-back impellers for balanced hydraulic thrust • easily replaceable threaded impeller wearing rings • long-life labyrinth case rings • ring-oiled ball bearings—plus ten other important design features. They are available in sizes from 2 inch to 8 inch discharge, for capacities to 3000 gpm and heads to 750 feet. *Write for Bulletin 1501 giving complete data.*

Consulting Engineer
Angus D. Henderson
Westbury, L. I., N. Y.

Contractor
D. Fortunato, Inc.
Floral Park, L. I., N. Y.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
871 Nottingham Way, Trenton 2, New Jersey

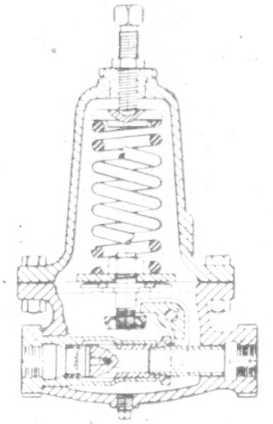
DL 387

proven performance at
GE

For better molded products...

CASH STANDARD type 1000 VALVES

keep mold temperatures in the "Safety Zone"



In the production of molded parts, uniform quality is assured through careful control of time, temperature, pressure and other factors in the molding cycle.

A leading producer of precision molded plastics parts is General Electric Company's Plastics Department, Decatur, Ill. On G-E's compression molding machines, almost 200 Cash Standard Type 1000 Reducing Valves are in use, keeping mold temperatures constant by controlling the steam supply.

Donald F. Thompson, G-E's Supervisor of Plant and Facilities Engineering, says: "For our particular application, where we use a large number of reducers, it is essential that the initial cost and maintenance cost be held to a minimum. We have found that Cash Standard 1000's have done the job very effectively."

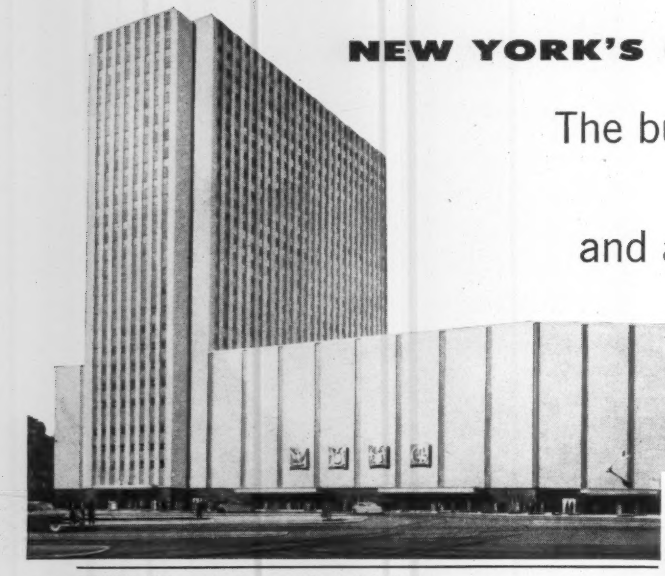
The unique construction of this valve provides high capacity and accurate control of steam, water, air, oil and most gases and chemicals. Exclusive streamlined inner valve eliminates turbulence; flow through valve housing is in a straight uninterrupted line; an aspirating effect controls valve opening by amplifying slight pressure changes into large valve operating forces.

What's *your* control problem? Contact the Cash Standard control specialist in your area for more information on this unusual valve and other Cash Standard control products, or write Dept. B.

CASH CS STANDARD

A. W. Cash Co. and Its Subsidiary, Cash Standard Stacon Corp.
P. O. Box 551, Decatur, Ill.

Pressure, Hydraulic, Temperature, Process and Combustion Controls



NEW YORK'S COLISEUM—

The building that "has everything" has heating and air-conditioning systems of

NATIONAL PIPE

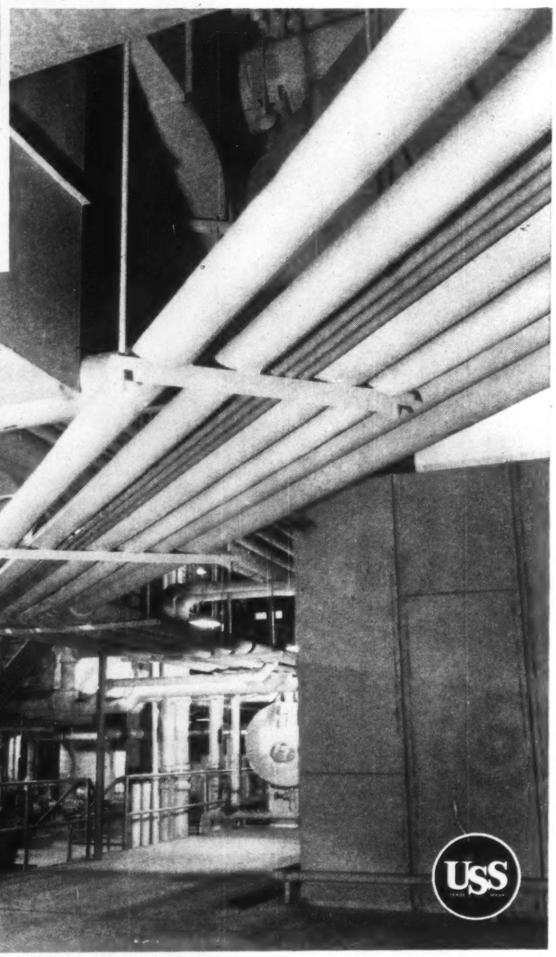
OWNER: Triborough Bridge & Tunnel Authority
ARCHITECTS: Leon & Lionel Levy
CONSULTING ARCHITECTS: Eggers & Higgins, John B. Peterkin, Aymar Embury III
GENERAL CONTRACTOR: Walsh-Fuller-Slattery
HEATING & AIR CONDITIONING: Almirall & Company, Inc.
MECHANICAL & ELECTRICAL ENGINEERS: Guy B. Panero Associates
STRUCTURAL ENGINEER: Dr. Jacob Feld

NEW YORK CITY'S COLISEUM is one of the most distinctive and functional structures ever conceived. Its 26 floors and giant exhibition hall comprise an auditorium area capable of seating over 10,000 persons, approximately 1,000,000 sq. ft. of usable floor space, and an 850-car underground garage. Except for the garage, the building is completely air conditioned.

More than 376 tons of NATIONAL Pipe were used in the heating and air-conditioning systems of the new structure. The office building area requires 1,500 tons of refrigeration; the Coliseum proper requires 2,500 tons. Four compressors supply 4,000 tons of refrigeration for the high-pressure air-conditioning system.

Purchased steam is delivered at 125 to 150 psi. Pressure-reducing rigs reduce it to 50 psi and 5 psi for distribution throughout the buildings. Steam requirements are about 102,000 lbs. per hour for comfort heating and auxiliary uses.

Possessing a solid reputation for dependable service, USS NATIONAL PIPE is the choice of engineers and contractors throughout the country for air-conditioning, heating and power installations. It is synonymous with efficient, satisfactory service under all types of pressure and temperature conditions. For more complete information, get in touch with us. For technical assistance, our engineering staff is at your service.

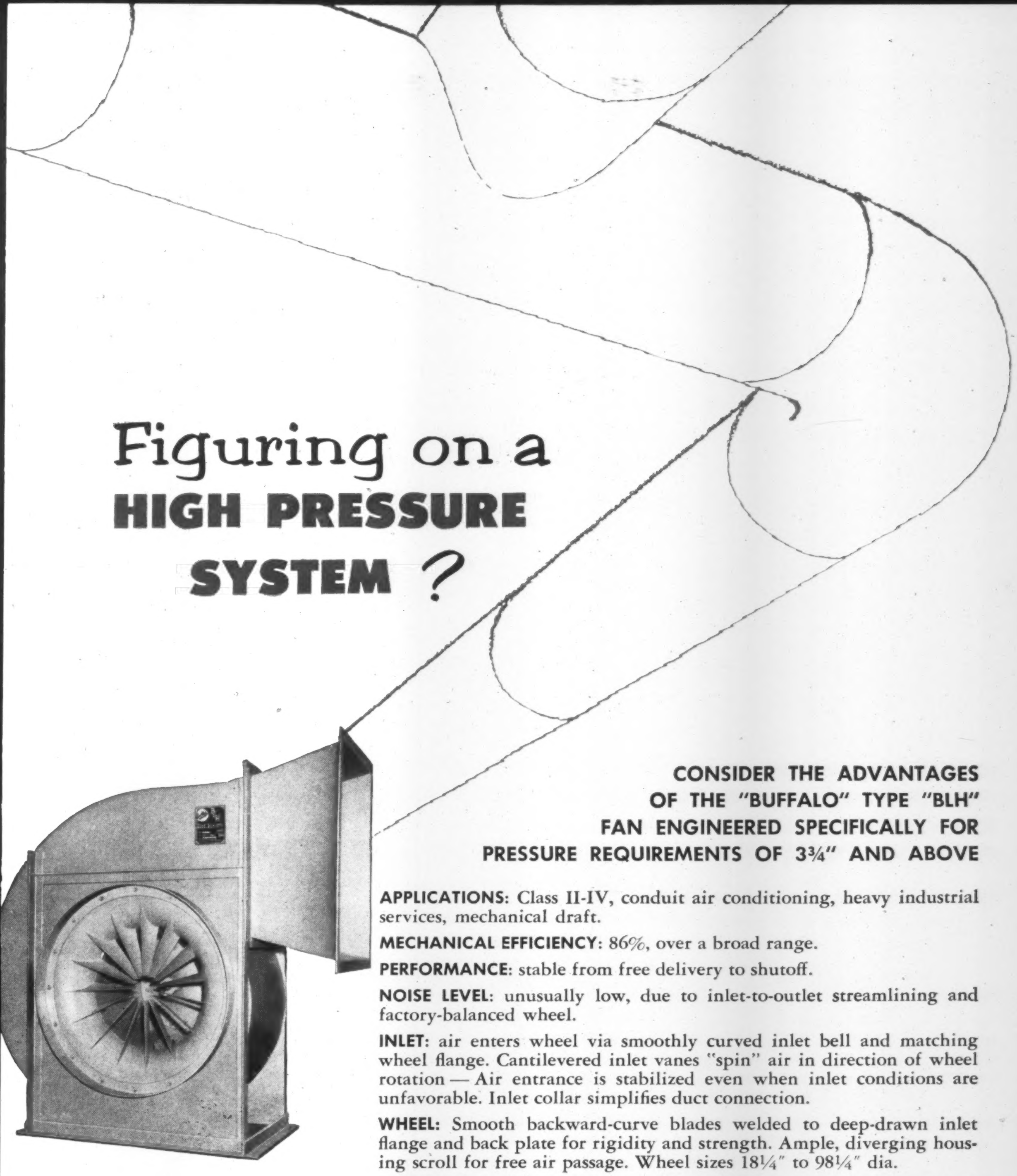


NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL PIPE

UNITED STATES STEEL

DL 387



Figuring on a HIGH PRESSURE SYSTEM ?

CONSIDER THE ADVANTAGES OF THE "BUFFALO" TYPE "BLH" FAN ENGINEERED SPECIFICALLY FOR PRESSURE REQUIREMENTS OF 3¾" AND ABOVE

APPLICATIONS: Class II-IV, conduit air conditioning, heavy industrial services, mechanical draft.

MECHANICAL EFFICIENCY: 86%, over a broad range.

PERFORMANCE: stable from free delivery to shutoff.

NOISE LEVEL: unusually low, due to inlet-to-outlet streamlining and factory-balanced wheel.

INLET: air enters wheel via smoothly curved inlet bell and matching wheel flange. Cantilevered inlet vanes "spin" air in direction of wheel rotation — Air entrance is stabilized even when inlet conditions are unfavorable. Inlet collar simplifies duct connection.

WHEEL: Smooth backward-curve blades welded to deep-drawn inlet flange and back plate for rigidity and strength. Ample, diverging housing scroll for free air passage. Wheel sizes 18¼" to 98¼" dia.

DIVERGENT OUTLET: eliminates outlet turbulence by providing gradual static conversion in dust.

"Q" FACTOR: the built-in Quality which provides trouble-free satisfaction and long life in every "Buffalo" Fan.

Write for Bulletin F-200 and recommendations on your air handling problem.

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

"Buffalo"

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

"from Chicago"

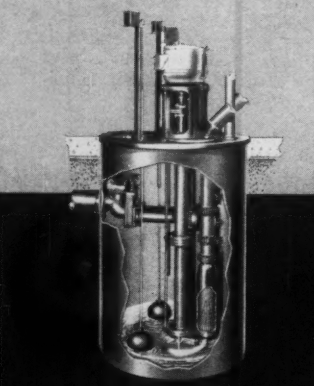
THE 'INSIDE' STORY IS IMPORTANT TOO!

SOCONY MOBIL BUILDING
NEW YORK, NEW YORK

ARCHITECTS: Harrison-Abramovitz and John B. Peterkin • GENERAL CONTRACTOR: Turner Construction Company, New York, New York • PLUMBING CONTRACTOR: Eugene Duklauer, Inc., 215 E. 38 Street, New York, New York • MECHANICAL ENGINEERS: Jaros, Baum and Bolles, 415 Lexington Avenue, New York, New York • PHOTO: Wurts Brothers, 15 East 40th Street, New York, New York

"FLUSH KLEEN"®
Sewage Ejector

. . . Automatically Backwashes Strainer . . . Strainer Keeps Solids From Basin And Pump . . . Water Only Handled By Impeller



The whole story of a modern skyscraper is not limited to striking architecture and gleaming exterior. Of equal importance is the equipment within the building that provides for comfort of the occupants and efficiency of the building operation.

In fine buildings everywhere, like New York's Socony Mobil Building, the Chicago Pump Company "FLUSH KLEEN"® Sewage Ejector is standard equipment because it is the only true clog proof ejector. More than 12,000 have been installed and not one has clogged.

In the "FLUSH KLEEN"® Sewage Ejector only liquid reaches the pump impeller. There is no contact between the ejector's working parts and coarse sewage material.

This is why the Chicago Pump Company "FLUSH KLEEN"® Sewage Ejector has an unequalled record of clog proof performance and is preferred throughout the building industry.

CHICAGO PUMP COMPANY
Building Pumps

Subsidiary of Food Machinery & Chemical Corporation
fmc
622 Diversey Parkway
Chicago 14, Illinois

Background for DEPENDABILITY

DUNHAM-BUSH
BRUNNER
SINCE 1906

You'll find a new reflection behind long famous Brunner Condensing Units.

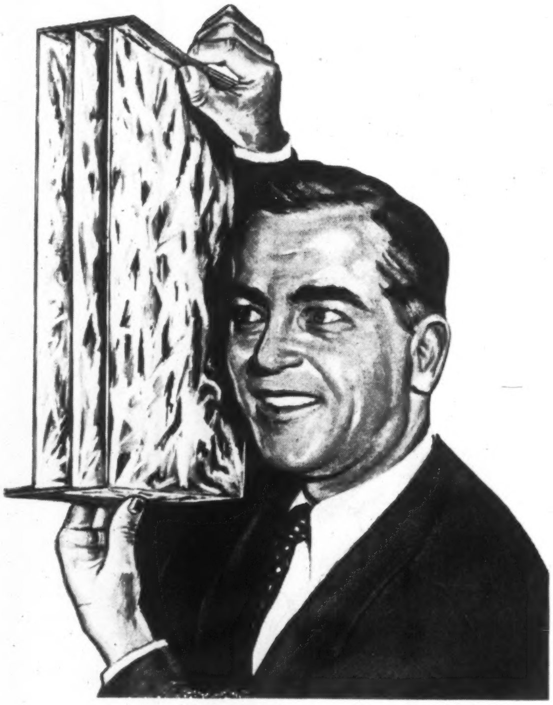
It's a reflection of the recently acquired prestige in joining Dunham-Bush . . . supplier of a complete line of dependable air conditioning, refrigeration and heating products.

It's a reflection of the ever available Brunner *and* Dunham-Bush sales engineer. He's near-by your town to help you solve problems . . . prevent problems. And remember, he represents not one but *three* great industries, air conditioning, refrigeration and heating.

This dual dependability is your assurance of even better Brunner products.

BRUNNER DIVISION
DUNHAM-BUSH, INC.
UTICA, NEW YORK

BRUNNER
SINCE 1906



Make this Test

for Heat Flow in Buildings!

Try this experiment. Take a piece of multiple layered aluminum. *(We'll send you some free samples.)* Hold it very close to your cheek without touching. You'll be surprised! Notice how, in seconds, your cheek feels a glow of warmth. Why? Because the heat rays which are leaving your face (although without temperature), are being thrown back again at a 97% rate by this amazing insulation. Reflected to your cheek, the rays are now re-absorbed at a 90% rate and turned into heat.

THE BIG THIEF

The same thing happens in building spaces. This simple experiment illustrates an extremely important principle of heat flow. The greatest thief of fuel, of heat, and of comfort in buildings in winter, and of comfort and electricity for air-cooling in summer, is the flow of heat by Radiation.

Put multiple sheets of scientific prefabricated aluminum insulation inside wall and roof spaces to bar the path of this thief. For multiple aluminum throws back, with 97% reflectivity, the heat rays that strike its surfaces. It also retards, most effectively, the flow of heat by Convection, Conduction, and Vapor Flow.

The tough aluminum sheets in multiple aluminum are almost completely impervious to water vapor, and are long and continuous. Infiltration under flat, stapled flanges is slight.

Where multiple aluminum is used, fortuitous vapor and water (for instance rain) which intrude into wall and similar spaces, will gradually flow out as vapor through exterior walls and roofs as pressure develops within, because vapor flows from areas of greater to less density. The vapor cannot back up through the continuous, almost completely impervious aluminum, so it flows *out* because exterior walls and roofs have substantial permeability compared to aluminum, far greater than the required 5 to 1 ratio.

For maximum uniform depth protection against heat loss and condensation formation, use **edge-to-edge** multiple aluminum, **each** sheet of which stretches from joist to joist.

Some very interesting heat flow tests in roofs and walls with aluminum insulations, at Massachusetts Institute of Technology and Pennsylvania State College Engineering Experiment Station, including exposure of aluminum foil over a period of 10 years to fumes, dust, salt sea air and even spray, are described in a booklet, "Thermal Test Coefficients of Aluminum Insulation for Buildings." Use coupon for free copy.

THERMAL VALUES
Infra Type 4 Parallel Insulation

Down-Heat C .042*=7⅞″ non-metallic insulation†
Up-Heat C .105*=3⅛″ non-metallic insulation†
Wall-Heat C .068*=4¾″ non-metallic insulation†

Cost installed between wood joists, material and labor, about 8¢ sq. ft.

Type 6 also available

Can be purchased everywhere through your preferred local dealer.

*Determined by method of National Bureau of Standards in H.H.F.A. Research Paper 32.
†Calculated on basis of limiting thermal values cited in Fed. Specs. LLL-f-321b; HH-I-585; HH-I-521c; HH-I-551a.

Infra Insulation, Inc., 525 B'way, N. Y., Dept. H-8

☐ Send booklet, "Thermal Test" ☐ Infra samples

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ADDRESS

The Editors' Pages

Building Outlays, Future Contracts Rise

THE VALUE of new construction put in place rose seasonally in June to $4354 million, slightly above the previous June record of $4288 million set in 1956, according to preliminary estimates by the U. S. Depts. of Commerce and Labor.

For the first six months of this year, construction activity amounted to an all time high of $21.5 billion, 3 percent above the figure reported for the first half of 1956. On a seasonally adjusted basis, outlays thus far in 1957 were at an annual rate of nearly $56.8 billion, compared with actual expenditures of $46.1 billion for the year 1956.

Virtually all types of construction shared in the 8 percent rise between May and June. Expenditures for public schools rose to all time highs. Outlays for private industrial buildings, offices, and warehouses and highways set a record for June.

Declines in new stores were nearly offset by rises in the other types of private construction.

As to future construction, contract awards in May rose sharply, according to the F. W. Dodge Corp. The total of $3,399,528,000 in May was 14 percent above the comparable month last year.

Contracts for nonresidential buildings totaled $1,119,587,000, in May, 11 percent higher than a year ago. Substantial gains were registered for hospital buildings, educational and science buildings, commercial buildings, and manufacturing buildings. ‡

Cost of Heating, Ventilating for N.Y.C. Rises

. . . almost a third higher last year

THE COST of heating and ventilating services in the public buildings operated by the New York city department of public works in the 12 months ending June 30, 1956, was $1,596,946, according to the annual report of Frederick H. Zurmuhlen, commissioner, issued recently.

At $0.214 per sq ft, this was nearly a third higher than for the previous year at $0.165 per sq ft.

A total of 3 million gal of fuel oil, 1000 tons of coal, and 300 million lb of purchased steam was used to heat the 60 buildings, compared to 2½ million gal of fuel oil, 1500 tons of coal, and 3000 million lb of purchased steam the year before.

Total area of the buildings, one more than in 1955, decreased from 7,477,100 sq ft to 7,460,900 sq ft. ‡

Central Air Conditioning Tops $½ Billion in 1956

. . . 28 percent increase over 1955

THE INSTALLED COST of central station air conditioning systems which went into operation in large office buildings, stores, and similar applications in the U. S. during 1956 is estimated at $556,670,000, according to the Air-Conditioning and Refrigeration Institute.

This is $122 million above the revised estimate for 1955, and almost $200 million over 1954.

The installed value of systems put in operation each year since 1950, based on figures reported to ARI, is estimated at:

1950	$241.770,000
1951	278.200,000
1952	252.920,000
1953	295.040,000
1954	378.810,000
1955	434.120,000
1956	556,670,000

The actual cost of compressors, condensing units, absorption and absorption systems, and centrifugal systems of 25 hp and over — the sizes covered by the above figures — is estimated at about 10 percent of the installed value of central station systems. The remainder includes labor, ducts, controls, insulation, piping, and all other installation costs. ‡

Underground Gas Storage Increasing Rapidly

. . . statistics show

THE U.S.'s gas utility and pipe line industry, which has spent nearly $½ billion for storage facilities to meet peak demands of its 30 million customers in winter months, has boosted its underground reservoir capacity of natural gas supplies to 3.4 trillion cu ft.

The American Gas Association, in the sixth annual statistical report of its committee on underground storage, reveals that an estimated 1.5 trillion cu ft of natural gas in storage was available at the end of 1956; that four states — Pennsylvania, Ohio, Michigan, and West Virginia — accounted for about 70 percent of this total; and that 188 storage pools with 7432 active wells were in operation at the end of 1956.

The committee report says additional areas are being developed rapidly.

Total storage capacity has been increased by 2½ trillion cu ft since 1951 and by 1.3 trillion cu ft in the past year alone, the report discloses. Colorado's reservoirs provide the greatest capacity — more than 1 trillion cu ft. Next in this respect are Pennsylvania, 425 billion cu ft; Ohio 395 billion; Michigan, 316 billion; and Oklahoma, 264 billion. These five states comprise approximately 71 percent of the national total of storage capacity.

Ten storage pools and 686 wells were added last year, over the 1956 totals of 178 pools and 6746 wells. At the end of 1950 there were 125 reservoirs containing 3853 wells devoted to underground storage. ‡

Engineers Must Be Versatile Today

. . . says industry leader

BECAUSE of the growing complexity of modern industry, management more and more is seeking versatility from the engineer, according to Willard F. Rockwell, Jr., president, Rockwell Manufacturing Co.

Operation of an industrial enterprise is complex — and getting more complex each year, says Mr. Rockwell. Because of this, it is becoming harder and harder to draw lines of differentiation or responsibility between skills, professions, and departments.

"Once the cry was for specialty, now the need is for versatility," says Mr. Rockwell, himself a graduate engineer from Pennsylvania State University.

All too frequently, he adds, the engineer tends to restrict his thinking and interest to the purely engineering aspects of a company.

"But today he must deal with sales, marketing, cost accounting, public relations, and other departments and sections," he says.

One of the important objectives of the engineer's education and training is clear, logical thinking, he says. "This makes him all the more valuable for the contribution he can make to the solution of problems in other phases of the company's operations." ‡

Four Compressor Units Serve Garden State Plaza

. . . 9000 tons of capacity

FOUR 2250 ton centrifugal compressors are installed in the engine room of the ultramodern Bamberger's store in the new Garden State Plaza shopping center in Paramus, N.J., according to the York Corp.

These four giant compressors will provide 9000 tons of cooling when the entire 110 acre shopping center is completed.

The centrally located engine room with its compressors, evaporators and condensers, will chill water for distribution to air handling units which are close to the spaces to be cooled. By this method, the engineer has kept all refrigeration equipment in one area for maintenance by one operating crew.

The compressors are driven by a-c unity power factor synchronous motors. Capacity control is provided by one simple prerotation vane control which can vary the system capacity over the full range automatically. ‡

Piping Test Loops Aid Atomic Studies

. . . control corrosion effects

TO HELP speed the development of peacetime atomic power, Westinghouse Electric Corp. engineers have placed into operation two new experimental atomic "test loops," according to D. W. Gunther, manager of the company's materials engineering department.

The test loops, Mr. Gunther said, will aid in the development and application of new "atomic" materials and supply information to guide the design and manufacture of atomic power equipment.

Each of the test loops consists of a system of stainless steel pipes containing a fluid which can be pumped past test specimens placed inside the system. Chemicals added to the fluid vary its corrosive effect on the specimens under test. The temperature, pressure, and velocity of flow of the fluid are closely controlled.

The main function of these new loops will be to study the corrosive effects of hot, pressurized fluids on the structural materials in nuclear power plants. They will be devoted to such specialized tasks as developing and testing corrosion inhibitors, corrosion resistant alloys, and corrosion resistant joints in structural materials. The design and construction of the test loops was under the supervision of R. L. Phipps of Westinghouse's physical testing laboratory.

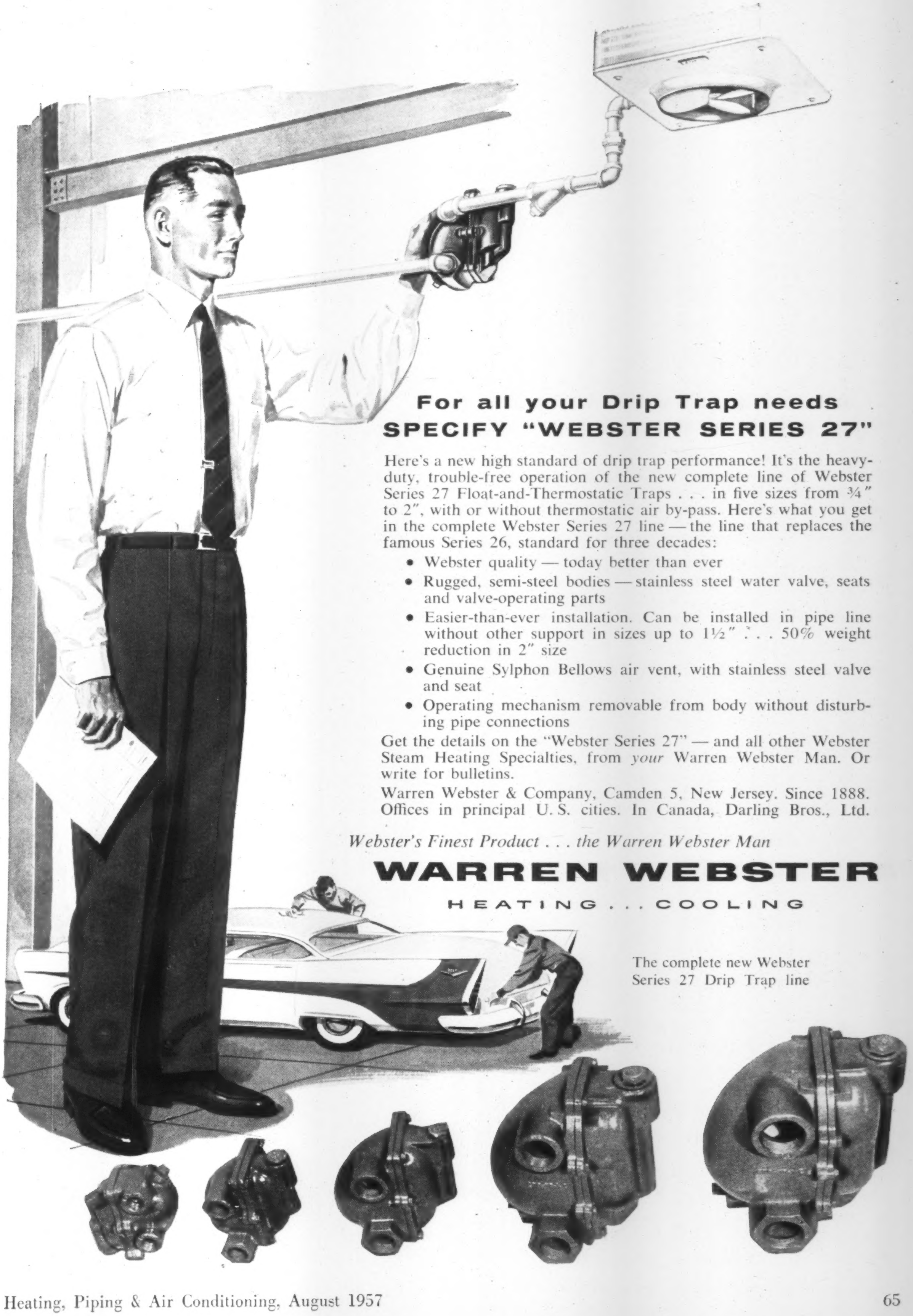
"The loops were designed to operate at pressures up to 2000 psig and temperatures as high as 600 F," Mr. Phipps explained. "These conditions, which are similar to those existing in actual atomic power plants, are maintained by a thermal pressurizer and external heaters."

The fluid in the loops is circulated by a "canned motor" pump inserted directly into the system. Before the fluid is admitted to the loops it is purified and degassed in a special purification system. A small amount of the fluid is continuously diverted from the loop and circulated through a deionizing loop which removes the corrosion products from the fluid and provides for sampling and tests of purity.

Each loop has two identical test sections which hold the specimens to be exposed to the fluid. Each section is equipped to handle up to 105 specimens at a time, and are so arranged that one can be shut down for removal of the specimens without stopping tests in the other. ‡

"Quote"

"Engineers have become the aristocracy of necessity."—*M. S. Coover, president, American Institute of Electrical Engineers, and administrative assistant, Div. of Engineering, Iowa State college, in a speech before the recent Great Lakes District Meeting of the AIEE in Des Moines, Ia.*



For all your Drip Trap needs SPECIFY "WEBSTER SERIES 27"

Here's a new high standard of drip trap performance! It's the heavy-duty, trouble-free operation of the new complete line of Webster Series 27 Float-and-Thermostatic Traps . . . in five sizes from ¾" to 2", with or without thermostatic air by-pass. Here's what you get in the complete Webster Series 27 line — the line that replaces the famous Series 26, standard for three decades:

- Webster quality — today better than ever
- Rugged, semi-steel bodies — stainless steel water valve, seats and valve-operating parts
- Easier-than-ever installation. Can be installed in pipe line without other support in sizes up to 1½" . . . 50% weight reduction in 2" size
- Genuine Sylphon Bellows air vent, with stainless steel valve and seat
- Operating mechanism removable from body without disturbing pipe connections

Get the details on the "Webster Series 27" — and all other Webster Steam Heating Specialties, from *your* Warren Webster Man. Or write for bulletins.

Warren Webster & Company, Camden 5, New Jersey. Since 1888. Offices in principal U. S. cities. In Canada, Darling Bros., Ltd.

Webster's Finest Product . . . the Warren Webster Man

WARREN WEBSTER

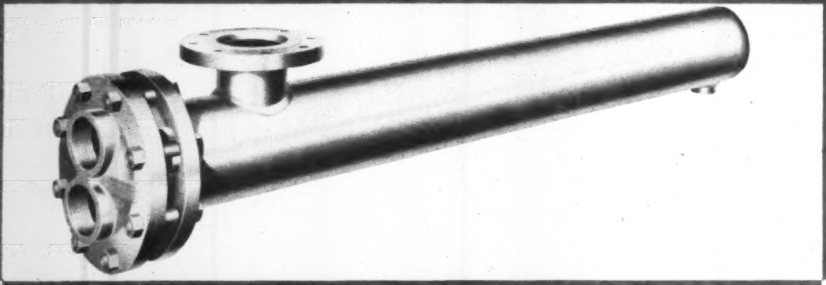
HEATING . . . COOLING

The complete new Webster Series 27 Drip Trap line

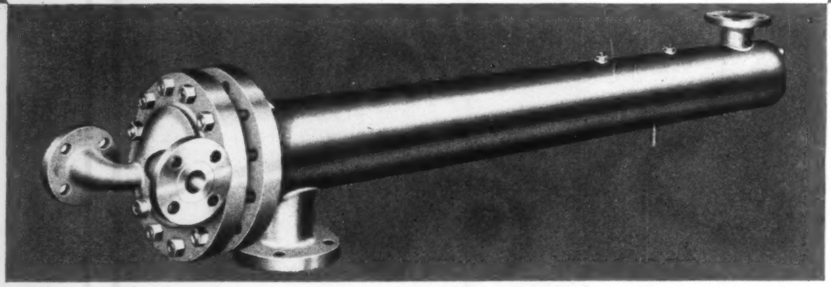
NEW FROM TACO

A STANDARDIZED LINE OF A. S. A. HEAT EXCHANGERS AND HIGH TEMPERATURE–HIGH PRESSURE CONVERTERS

For general applications, specify the Taco "L" or "S" series Heat Exchangers.



For High Temperature-High Pressure, specify the rugged new Taco HT series converters. Working pressures to 400 p.s.i. Operating temperatures to 450°F.



Both new lines of Taco Heat Exchangers are made under strict quality control production to A.S.M.E. code and A.S.A. flange standards.

TACO HEATERS, INCORPORATED

1160 CRANSTON STREET, CRANSTON, RHODE ISLAND

Corporate Office: 342 Madison Avenue., New York 17, New York
In Canada: Taco Heaters of Canada, Ltd., 4 Gilead Place, Toronto 2

CIRCULATOR • 170 PUMP • MP PUMP • FLOCHEK • AIR-SCOOP • TACO–VENT • TEMPERING VALVE • VENTURI

Please send me at no cost your new: **H.P.**

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☐ High Temperature-High Pressure converter catalog
☐ Both

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"Open for Discussion"

• WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

Air Conditioning Advances Evaporative Cooling, Too

THE ARTICLE *How Trial and Error Evaporative Cooling Pioneered Air Conditioning* by Logan Lewis in the June HPAC is an interesting history of the development of air conditioning from evaporative cooling. It can also be pointed out, however, that advances in air conditioning have spurred improvements in evaporative cooling methods and equipment.

From the cooling standpoint only, evaporative cooling and air conditioning compete actively today. In fact, many installations include both methods of obtaining lower dry bulb temperatures. Both cooperate to produce economical comfort cooling in many instances.

S. F. DUNCAN
Farr Co.
Los Angeles

Suggests Two Sets of Standards Be Adopted for Spec Writing

FLACCID DECISIONS are being daily rendered by architects and consulting engineers who permit wholesale substitutions on projects of their design.

The underlying philosophy is apparently that of being fair towards the contractor and the vendors. Does this attitude bear the strictest test of fairness towards the client?

Many professional men have no pre-New Deal experiences. Most men now pursuing the design profession, whether engineer or architect, have only a background of government type specifications. They have been influenced by philosophies which stress open specifications, which encourage generalizations. Those who have practiced in the '20's, have subconsciously drifted into the same attitude of weak specifications until now we find the accepted belief that at least three manufacturers must be completely equal on each item of a structure.

Our national economy has only in recent years approached a return to what might be termed normal functions. During the '30's we had a controlled construction industry due to the recovery measures undertaken by our national government. During the '40's we had a controlled construction industry due to the war. In those years the impression that an engineer or architect should select for his client the brand names as well as the type of materials vanished from an otherwise aggressive segment of American professionalism.

There is a feeling among many architects now that the present system of open, or some would say semi-open, specifications permits adequate control of materials. However, it should be apparent that the trend is toward weaker specifications because of some minor concessions made here and there.

Recognizing this, what would the result be if attitudes towards substitutions should tighten without any change in specification form? Suppose approvals of materials approved on former jobs should be withheld? The apparent need is for a change in specification form to indicate a changed attitude towards contractors' options on material uses.

It is recognized that on certain types of government financed work there is a political necessity to couch design and specification phrases in general terms. With such background atmosphere, the architect and engineer must design, knowing that the finished working job will appear and perform only approximately as designed.

Why though, must all design work be fabricated from generalties? What is so wrong with selection of materials and equipment in the design phase? Why isn't the interest of the client best served by selection of equipment during design?

In the design of a structure a client must be given the thought and consideration he is paying for. The architect must protect the interests of his client; not the interests of the various manufacturers. The best integration of a project is to select one piece of equipment for each need and to design on that basis, building upon soundly established units.

Every architect and engineer recognizes in material substitutions the unspoken confession that here is something cheaper which the contractor believes will be accepted as an equal to the specifications. Every contractor and agent builds up over the years of experience a good working knowledge of the strength or weakness of specifications of each designing engineer or architect.

The present practice of accepting "equals" discourages the improvements of design and manufacturing. Inferior low cost equipment is accordingly being encouraged. It is apparent that some manufacturers with well known lines are aiming their design work towards the minimum which will be acceptable. Other manufacturers who are obviously trying to put extra quality into their products are being forced to compete on the same price basis as the former type. This results in the progressive manufacturer being penalized.

In the field of heating, piping, and air conditioning, there are many examples of good and bad equipment being forced to compete on equal price footings. Little recognition is given of superior workmanship in boiler construction for example, the design of the boiler, or other small details which differentiate the average boiler and the superior boiler. In radiation, not enough attention is paid to the means of panel stiffening, the external appearance, the wall streaking characteristics, the details of construction which facilitate access and maintenance. Similar comments can be made regarding compressors, cooling towers, air handling units, pumps, and other equipment. Instead of selecting what in the opinion of the engineer and architect is best for the client, a set of conditions is established and both mediocre and quality are invited to compete on the same basis.

A practical solution to this problem was presented recently. It is a system of checks and balances which a few architects and engineers are attempting currently. That is, the low bidder has the privilege of offering substitutes on the basis of credits to the contract. In this manner the engineer and architect both retain complete control over the material selection, and the client benefits financially if a concession to quality is recommended. However, in bidding the job, all contractors base their figures on the same materials, thus bidding on a fair competitive basis with the other contractors for the job.

Another problem stems from the fact that the American public wants to buy quality. The failure of the design professions to insist on quality is an open invitation to the quality manufacturers to bypass the professional man and go direct to the owners. This is being felt now, particularly in the field of air conditioning. Some engineers complain about the encroachment upon the realm of the consultant by manufacturers without realizing that their complaints can be traced back to their indifferent specifications.

One solution to this rather grave problem is for architects and engineers to adopt two sets of standards. One design standard would be a retention of the present weak specification type of attitude for the Federal government work on which they are required by law to write an open specification. The other would be aimed toward the bulk of their work such as schools, churches, institutional buildings, office buildings, factories, and warehouses.

The writing of stiff specifications and the drawing of demanding plans can result in better buildings and greater values for the client. In addition, the stabilization of the market which would result would lead to better contract performance and more efficient servicing of equipment.

E. W. Klein, Jr.
E. W. Klein & Co.
Atlanta, Ga.

Should Shutoff Valves Be Installed On Pressure Controls?

Regarding the cover photo of the December 1956 HPAC — illustrating the boiler annunciator system described in the article by Tom D. B. Thomas — the installation of gage cocks as outlined in this system would clearly and entirely defeat the purpose of the control system if any one of the buildings were closed.

We do not feel that shutoff valves should be installed on pressure controls or similar safety control devices.

William F. Ryan
Ryan Engineering Co.
Consulting Engineers
Salina, Kan.

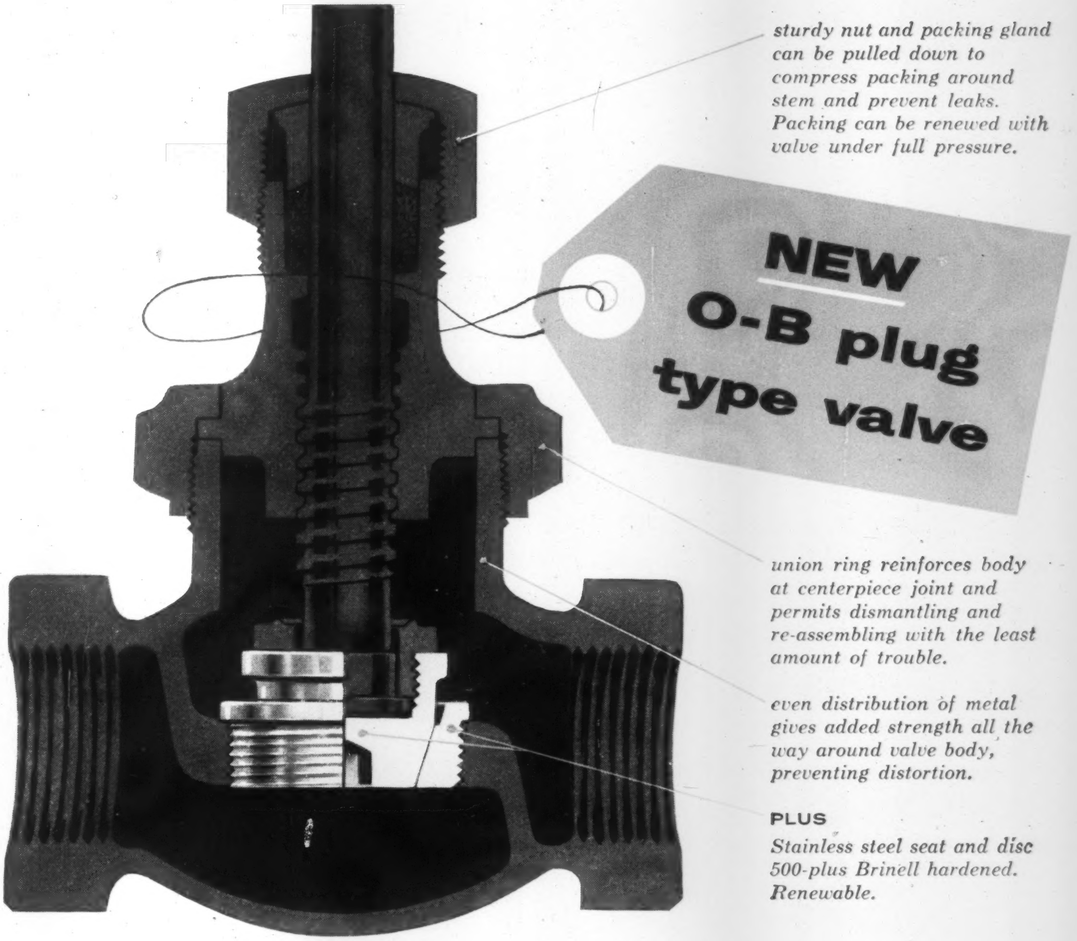
The Author's Reply—Mr. Ryan questions the wisdom of using the cocks shown in the photo and considers it a poor method of installing safety pressure controls on such a plant. However, he does not suggest how the installation should have been made.

In this installation, the cock to the left of the steam gage is for the inspector's master gage and creates no hazard. The cock on top of the siphon or pigtail meets the ASME code requirements and is jammed in the open position. The cock between the tee and first pressure control is also jammed in the open position, and therefore creates no hazard. To close the cock would require very definite and deliberate action; therefore, no hazard exists.

I agree with Mr. Ryan that shutoff valves should not be installed in conjunction with safety controls. But if such shutoff valves are easily operable and specific measures are taken to see that the cocks are jammed open — as previously stated — the system is comparable with one without cocks.

We are continuing to have excellent results from the signal system and are presently planning to add additional boilers to it when we effect a further reduction in personnel in the near future.

Tom D. B. Thomas
Superintendent, Boiler Operations
U. S. Naval Ammunition Depot
Crane, Ind.



sturdy nut and packing gland can be pulled down to compress packing around stem and prevent leaks. Packing can be renewed with valve under full pressure.

union ring reinforces body at centerpiece joint and permits dismantling and re-assembling with the least amount of trouble.

even distribution of metal gives added strength all the way around valve body, preventing distortion.

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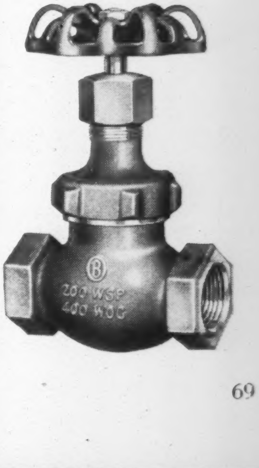
Stainless steel seat and disc 500-plus Brinell hardened. Renewable.

for customers who demand a tough, long-lasting valve...

When the service is severe and an ordinary valve just can't take it . . . when the job calls for a valve that will give top performance for a long, long time . . . make your customer happy by putting in a new O-B Plug Type valve. He'll appreciate the ruggedness and the extra long-life features shown above. But, most of all he'll appreciate you for installing a valve that cuts his maintenance problems.

O-B Plug Type valves are available as either globes or angles for 150 lbs. WSP and 200 lbs. WSP. For more complete information contact your O-B distributor, or write to the Ohio Brass Company, 380 North Main Street, Mansfield, Ohio.

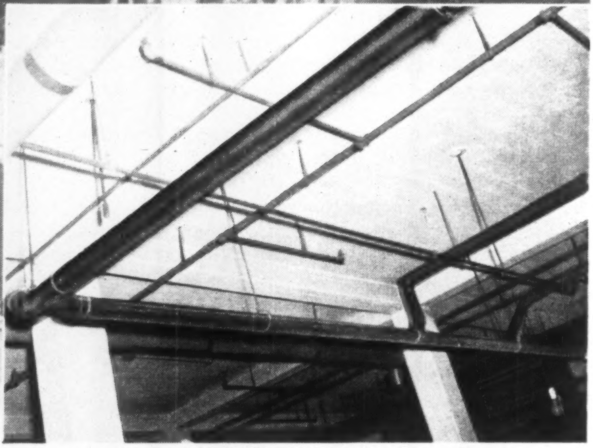
O-B VALVES



4729-V

Rusted-out

LOS ANGELES COUNTY GENERAL HOSPITAL—one of the country's largest—contains what is said to be the first **Copper Drainage** System of its kind west of the Mississippi.



IN LONG RUNS LIKE THIS installation is speedier because there are fewer fittings with Revere Copper Water Tube. And, due to its lightness there is no support problem. 3,200 feet of Revere Type "K" Copper Tube, in sizes of 2", 3", and 4" were used in the drainage lines.

drainage lines replaced

with enduring
REVERE COPPER TUBE

• without interruption of kitchen service • at less cost than a duplicate, rustable drainage line

Revere Copper Tube was made to order for this job. Not only will it prevent future rust trouble, but the kitchen continued to have drainage service. For, with Revere Copper Tube, using solder fittings, it was possible to run a line right alongside of the failed line . . . something which the plumbing foreman on the job said would have been virtually impossible had the line been replaced with duplicate, rustable drainage material.

This was because the small amount of space in the tunnels through which the lines ran would not permit sufficient room to caulk the joints, while the solder joints used with Revere Copper Tube were readily made.

In addition, D & D PLUMBING & HEATING CO., of Bell Gardens, California told us that the Revere Copper Tube drainage line was fabricated and installed for a lower price than would have been the case had standard drainage material been used. Here are the reasons why:

1. Revere Copper Drainage Tube is easier to handle, weighing, with fittings, only about ¼ as much as ferrous materials.

2. Revere Copper Drainage Tube comes in standard 20′ lengths so fewer joints are needed on long runs.

3. Revere Copper Drainage Tube and fittings are installed by a simple soldering operation. No caulking or threading, and soldered joints are water and gas-tight. No wrench-space worries.

4. Revere Copper Drainage Tube Assemblies can be prefabricated in the shop or on the job with no danger of weakening joints when handling, thus saving time and costs.

5. Revere Copper Drainage Tube requires less space in walls. No wide walls or build-outs. Where 3″ vent stacks are permitted, they will fit inside a standard 4″ stud partition.

6. Revere Copper Drainage Tube is gun-barrel smooth inside and out, frictional resistance to flow is low, and clogging due to corrosion or waste build-up is virtually non-existent.

These same features, which are inherent in various types of Revere Copper Water Tube, make it the preference of contractors, architects and engineers for radiant panel heating, hot and cold water lines, underground service lines and processing lines. See the Revere Distributor nearest you for your needs.

REVERE COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Rome, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

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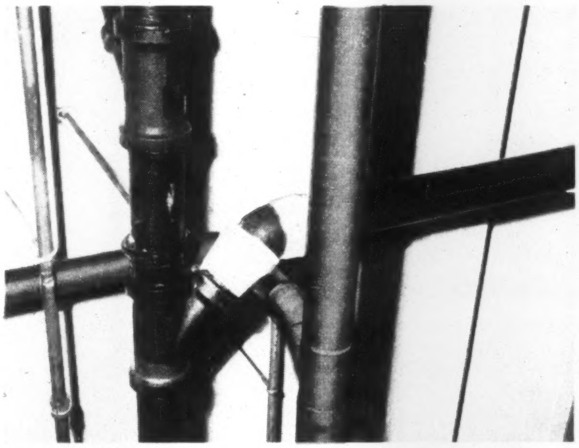


OLD KITCHEN DRAINAGE LINES with new Revere Copper Tube installed alongside. Because the kitchen was in use almost 24 hours a day, the drainage lines took a severe beating. Result: stoppages often occurred and a snake had to be used repeatedly. Holes were eventually poked through the pipe and had to be covered with tape and tar to prevent leakage. With smooth-finish Revere Copper Water Tube frictional resistance will be low and clogging due to corrosion or waste build-up practically impossible.

IT'S IN CLOSE QUARTERS LIKE THIS that Revere Copper Water Tube really shines. For the solder fittings used require no wrench space and its small sizes make installation of Revere Copper Water Tube, in the tightest corners, a cinch. The Revere Tube on this job was supplied to the D & D PLUMBING & HEATING COMPANY of Bell Gardens, California by AMSTAN SUPPLY DIVISION OF AMERICAN-STANDARD, Los Angeles Branch.

Question of the Month

How Should We Heat a Thawing Shed?

This question was asked previously in HPAC and is repeated here along with an answer that has been received from a reader. Other answers or comments for publication are invited. One answer was given in the July issue.

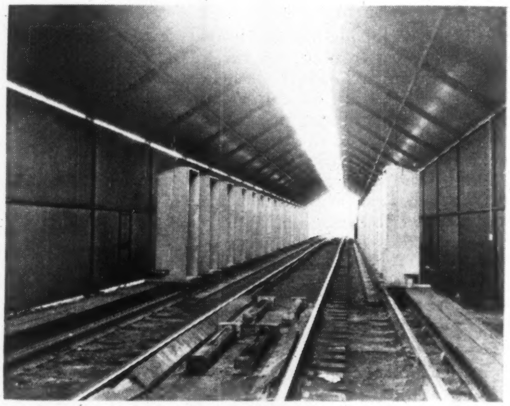
"We have been asked to design the heating system for a coal and ore thawing shed where the temperature is to be maintained at 200 F. It seems that direct fired heaters would satisfy this requirement, and this has been suggested. If direct fired heaters are to be used, the air within the shed is to be recirculated through the heater continuously. Ducts will be used to distribute this heated air to the locations in the shed where it will do the most good in the thawing operation. The ice crust around the perimeter of the coal and ore cars is about 15 in. thick under design conditions." —*R.C.B.*

Infrared Gas Heaters Speed Thawing, Save on Fuel and Labor

INFRARED gas generators designed to thaw frozen coal and ore cars substantially increase the number of frozen cars which can be thawed and unloaded per hour, and without any increase in operating and fuel costs. In fact, the car unloading capacity increased between 50 and 75 percent during the first six weeks' operation of the ore thawing facility of the Toledo Lakefront Dock Co., Toledo, Ohio. The goal is 100 percent increase over the old method. The accumulated overall operation and fuel cost saving is very substantial.

The infrared gas heater depends for its operation upon a ceramic that is precision punched with fine holes (200 per sq in.) giving the appearance of a miniature honeycomb through which gas flows. Combustion takes place on the surface of the ceramic; and in accordance with a thermo-physical principle — Wien's displacement law — and because of the high temperature involved, a large percentage of infrared rays are produced. The ceramic, which is the key component of the whole device, has the peculiar characteristic of not transmitting sufficient heat to the gas chamber to cause the flash point to be reached.

In 1956 a seven car thawing installation was built along tracks leading to one Lakefront dumper.



ORE THAWING SHED contains 36 gas fired infrared heaters, about six per car on each side. Note "hot dog" torches between rails

PORTABLE UNITS each have four banks of four ray heads. Each bank may be separately turned on or off, raised or lowered, and tilted up or down

Metal windbreaks about 12 ft high and 30 ft long — seven car lengths — supported on a steel framework were constructed on both sides of the track.

In demonstration tests at the ore thawing facility, six specially built portable units were installed.

(*Continued on page 74*)

new

single seated

Temperature Regulator

— RUGGED

— ACCURATE

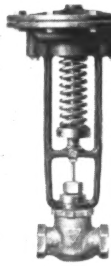
— SELF-CONTAINED

Series 155 — direct-acting temperature regulators. They maintain the liquid temperature by controlling the heating source such as steam. Available in body connection sizes ½" to 1½" inclusive.

Series 157 — reverse-acting temperature regulators. Used to maintain the liquid temperature by controlling the cooling source such as water. Sizes ½" to 1" inclusive.

STANDARDLY AVAILABLE WITH: Temperature ranges of 40°F between 100° and 240°F. Overheat protection, bronze body construction with replaceable stainless steel seats, copper bulb, bronze bushing, and copper capillary cable protected by asbestos packed armor. Adjust for temperature control by turning adjusting collar.

Send for DESCRIPTIVE LITERATURE.



PRESSURE REGULATORS for . . .

Steam, Air, Water

For your other regulation requirements, Watts has: Spring or weight and lever type, single seated diaphragm pressure regulators. Initial pressures up to 250 lbs. Reduced pressure range 1 to 100 lbs. Sizes ½" to 3" inclusive—Complete line of self-contained pressure regulators sizes ½" to 2".

WATTS REGULATOR COMPANY

Since 1875

WATTS REGULATOR COMPANY

Plumbing and Heating
Safety Valves and
Controls

Lawrence, Massachusetts

(*Continued from page 72*)

Each unit, made up of 16 ray heads, has a total input rating of about 320,000 Btu per hr. These units were mounted on a steel frame equipped with wheels or adjustable bases. The units were enclosed on the sides, backs, and tops with an insulated housing to improve heat concentration where desired.

Each unit has four banks of four ray heads each, and each bank is entirely selfcontained so that it may be turned on or off at will, raised or lowered, and tilted up or down. The frame is about 8½ ft high and reaches well above the center of a hopper car. Extra height may be provided so that the infrared rays may be directed on the top of a car if desired.

At times during the tests the larger units were supplemented by two smaller units with eight ray heads each. These units were unenclosed.

In other combinations, four "hot dogs," or oil torches mounted in 6 ft long, 6 in. diam perforated nickel alloy metal pipes were installed between rails under the car. These "hot dogs" have a total input rating of 700,000 Btu per hr each.

Development of a new gas fired infrared "hot dog" rated at 300,000 Btu per hr will add further to the effectiveness and economy of this operation which eventually will be uniformly fed by propane gas. Use of natural gas, or a combination of natural and manufactured gas will effect even further savings.

Various groupings of the heating facilities were used ranging from concentration of infrared units on the forward end of a car, then dispersal of these units over the entire sides and slope sheets, then later the addition of four "hot dogs" under the car.

These tests indicated that with a sufficient number of infrared units — six on each side estimated — frozen coal along the sides of a car can be thawed for dumping in a reasonable time. In hopper cars the pockets, where moisture has collected and caused coal to freeze solidly, usually are the most troublesome spots. To do the best possible job on these pockets requires the application of heat under them as well as from the sides.

Recently a roof was added to the windbreak and 36 gas infrared units were substituted for the existing heaters. To date, this has resulted in about doubling the dumping rate and reducing fuel costs by about 40 percent. In addition, there has been a sizable saving in labor.

D. E. HENDERSON
Infrared Special Applications Section
Perfection Industries
Div. of Hupp Corp.
Cleveland, Ohio

Reader Asks—

"What Causes Soot Problem in High Pressure Air Conditioning?"

"We have encountered an oily soot problem in our office building air conditioning system. The building consists of seven floors above a garage at grade level and below.

"The air conditioning system consists of a perimeter system for zone control, and a hot and cold deck interior system. Both systems are equipped with automatic oil type filters as well as electric precipitator type filters in series. The perimeter system air intake is at the first floor level approximately 20 ft above grade; the interior system air intake is in the penthouse on the roof.

"Oily soot of 1/16 in. diam and smaller fluffy spherical particles is discharged from the high pressure primary air ducts of the perimeter system, and from the ceiling supply units. Dust checks on the precipitators and on the cooling and heating coils fail to show any signs of the soot; target plates coated with petroleum jelly installed inside the coil and filter plenum also fail to show evidence of soot.

"Could micron size particles of soot be agglomerated into larger particles downstream of the supply fans? I would like to know what is causing this problem and how we may correct it." — W.G.M.

• *YOU ARE INVITED to answer this question. Write: The Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

Package Air Conditioner Sales to Rise

. . . symposium speaker predicts

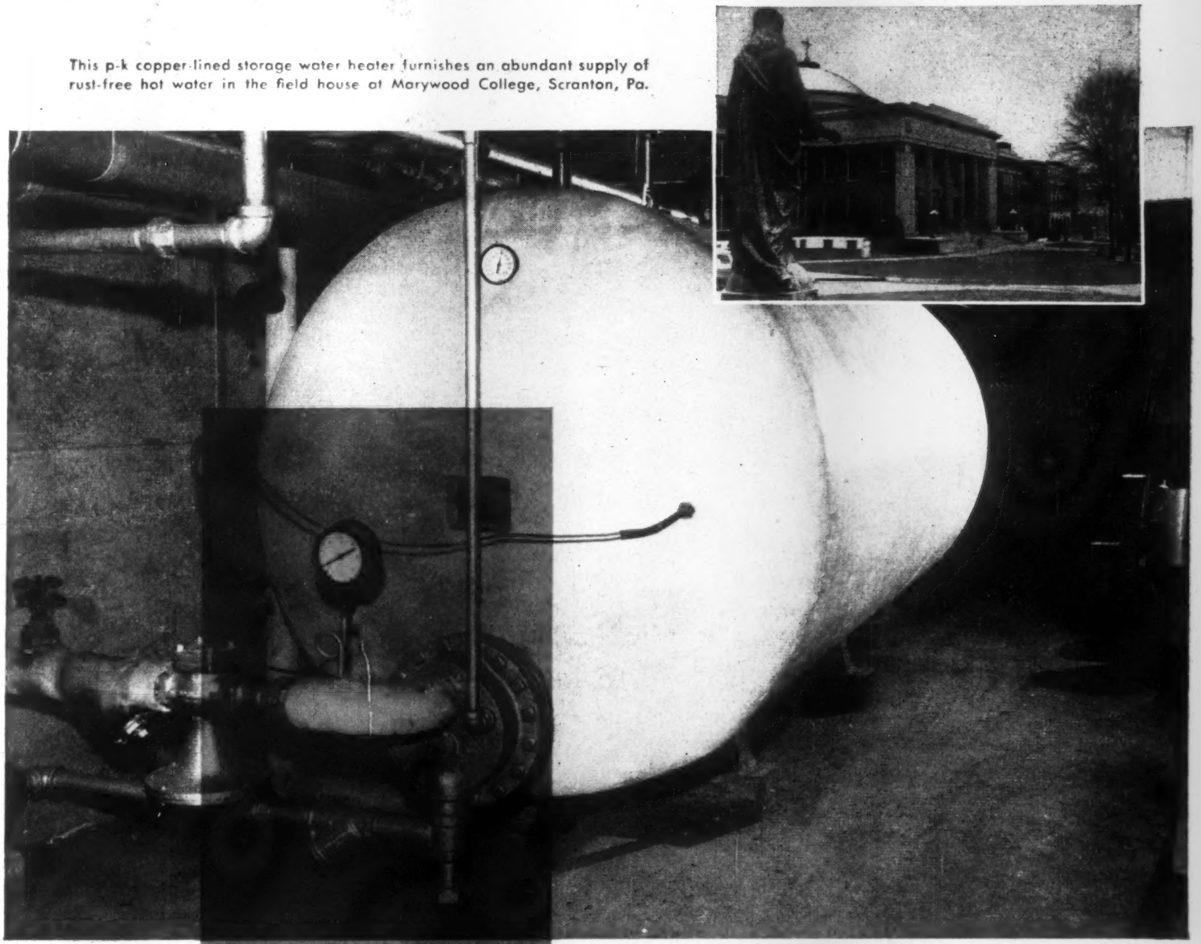
A PREDICTION that sales of selfcontained air conditioning units would rise to consistent new highs in the years ahead was made by W. G. Wassmandorf of The Trane Co. in a talk at the recent Electric Air Conditioning and Heating Symposium held in Roanoke, Va.

The speaker, reciprocating compressor sales manager, said, "Since 1950, sales of selfcontained air conditioners have increased at a rate comparable to the general growth of the air conditioning industry.

"In 1950, manufacturers of self contained air conditioners shipped about 56,350 units. Plans for 1957 indicate sales totaling 85,000 units, and by 1956, we believe the rate of sales growth of these units will exceed that of the other air conditioning products."

He cited the fact that a continual growth has been noted in the sales of package units, regardless of weather or business conditions. Highlights of the two day symposium, attended by more than 200 area architects, consulting engineers, and others, were reported in the May HPAC. The meeting was sponsored by the Appalachian Electric Power Co. in association with eight of the nation's leading heating and air conditioning manufacturers. ⌗

This p-k copper-lined storage water heater furnishes an abundant supply of rust-free hot water in the field house at Marywood College, Scranton, Pa.

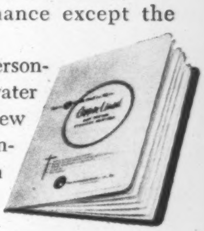


Marywood College depends for rust-free hot water on p-k copper-lined storage heaters

In 1949, Marywood purchased a p-k copper-lined heater shell to replace a plain steel heater in O'Reilly Hall. Failures of the old plain steel tank had made immediate replacement necessary. The success of this installation caused the college to specify p-k equipment for a new music hall, residence building, science building and field house, all part of a continuous expansion program.

You can expect such results from p-k copper-lined heaters. By combining the noncorrosive qualities of copper with the superior strength of steel, you are assured of an uninterrupted supply of rust-free hot water . . . year after year. And Patterson-Kelley copper-lined heaters are opened for inspection every two years, and require no maintenance except the removal of sediment.

To get all the facts about Patterson-Kelley copper-lined storage hot water heaters, write for your copy of the new data file No. 16 today. The Patterson-Kelley Co., Inc., 118 Warren Street, E. Stroudsburg, Pa.



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69¢-$1.79
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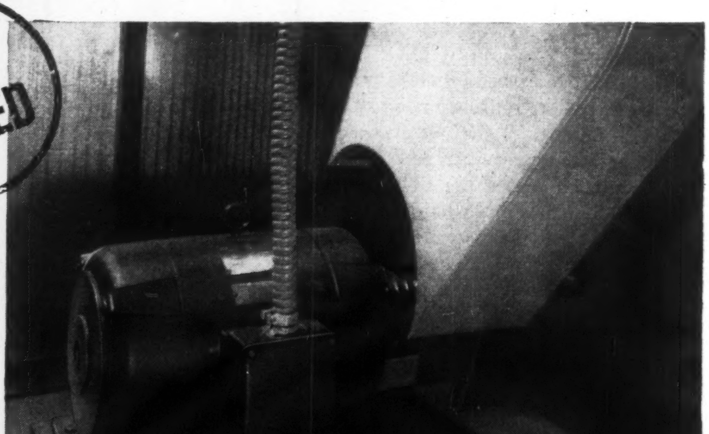
At This Kresge Store . . .

Westinghouse Life-Line A motors have

JOB TESTED



This busy self-service Kresge store, located in Ross Township, Pennsylvania, relies on Westinghouse Life-Line "A" motor-powered central air-conditioning to keep customers cool and comfortable while the temperature climbs outside.

3-99
99¢
$2.98
$2.98
$2.98
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BAG
$12
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proved outstanding for air conditioning

Westinghouse motors have been thoroughly tested in tough air-conditioning jobs like this . . . and have proven outstanding for quiet, long-term, dependable performance.

The Life-Line "A"® is built for rugged duty, with an amorized frame to assure proper alignment and protect against physical abuse. Ventilation openings in end brackets make the Westinghouse Life-Line "A" motor completely drip-proof, regardless of mounting position. 4-way sealed, prelubricated bearings keep grease in . . . dirt and water out . . . eliminates on-the-job greasing in out-of-the-way applications.

Tests in soundproof laboratories have proven that Life-Line "A" motors, through precision manufacture and dynamic balancing, are producing an operating sound level lower than any other standard motor.

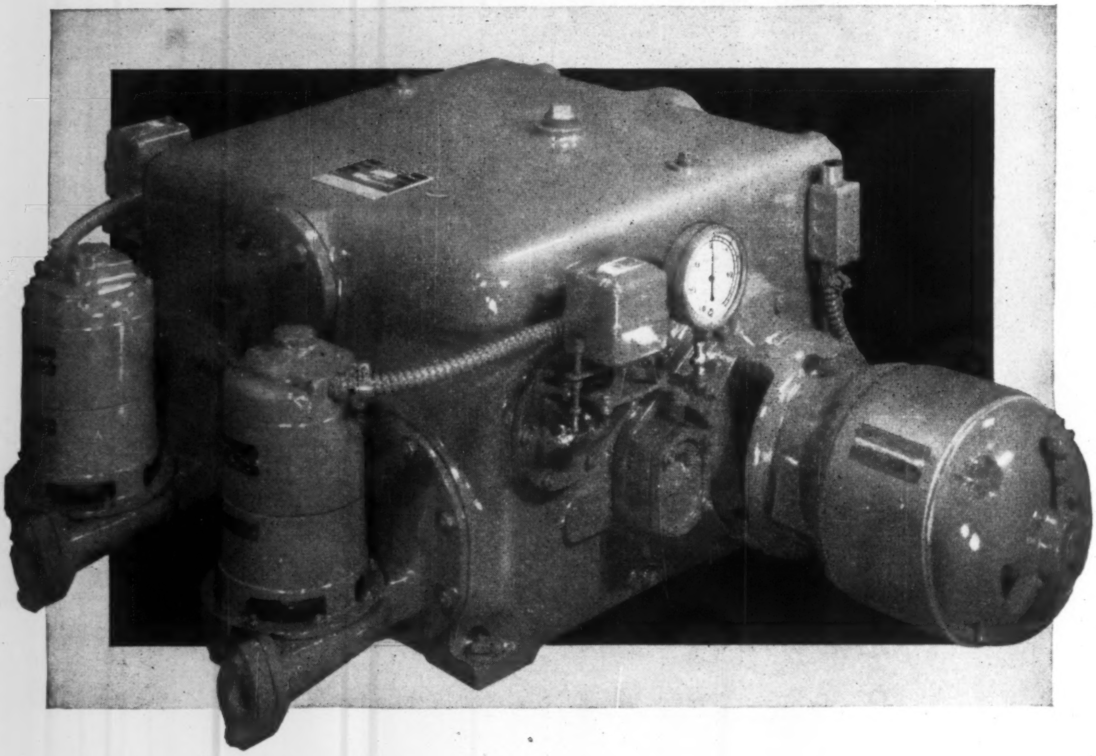
FOR COMPLETE INFORMATION, on these Westinghouse air-conditioning motors, call your Westinghouse sales engineer or distributor. Or, write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J-22057

YOU CAN BE SURE...IF IT'S Westinghouse

THIS NEW **VACUUM HEATING PUMP**

HAS THE INCREASED AIR CAPACITY
EFFICIENT HEATING PRACTICE DEMANDS



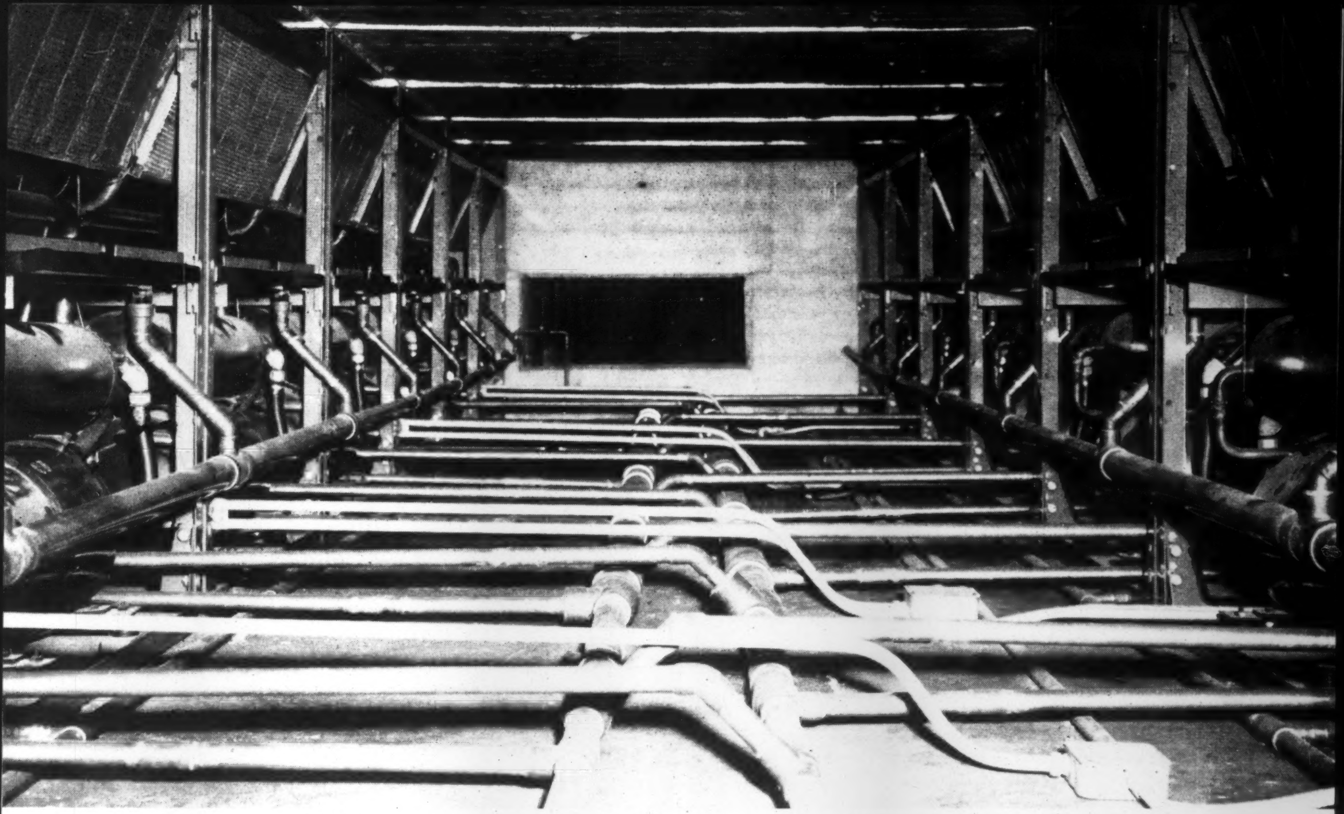
It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ Increased air capacity induces rapid system response without wasteful overheating.
- ✓ Separate air and water pumps individually selected to meet actual job requirements.
- ✓ Control system that operates individual pumps only when needed.
- ✓ Flexibility permitting addition of radiation without changing basic pump installation.
- ✓ Low, low, return line connection.

NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.



BACK PANELS REMOVED, 14 unit refrigeration circuits are arranged in two banks flanking central return air corridor in acoustically insulated room on hotel's second floor

Combined Sealed Cooling Units Cut Air Conditioning Costs

BY FRANK M. SEAY
Chief Engineer
John H. Couse
Air Conditioning Contractors

. . . in hotel, bank, and other installations. Low first and operating costs, easy installations, simple maintenance, and automatic multistep capacity control are among advantages.

THE USE of multiple hermetically sealed refrigeration sections for large air conditioning applications is not new, but we feel that it would be even wider if its advantages were better known. We not only were among the pioneers of this practice but are among its strongest advocates today. You will see why from two recent cases. The two systems described herein are our largest to date. We have installed several smaller systems of this nature. As of this writing, we have had practically no failures and no emergency service on any plants of this type.

Not long ago the Biltmore hotel in Palm Beach enlarged its dining room to seat 900 people. Built during the boom era about 1925, the Biltmore is one of the largest and finest hotels in the area. To keep up with the modern trend, the owners decided to enlarge the dining room and to air condition it.

Awarded the air conditioning contract, we calculated 6000 cfm of outdoor air for the 14,504 sq ft floor area, with a 13 ft, 2 in. high ceiling and 1200 sq ft of glass jalousies on the west wall. Design conditions provide 78 F dry bulb and 55 percent relative humidity when the outside temperatures are 93 F DB and 80 F WB. The total load was 73.3 tons: 45.5 sensible tons and 27.8 latent.

There was no equipment space adjacent to the dining room, so the owners designated a hotel room for the equipment. This room, right next to a mechanical service corridor, is also nestled among hotel rooms. Therefore, quietness was a prime consideration.

A second consideration was a system that was foolproof in regard to upkeep and servicing by hotel personnel. The hotel is open only six months of the year and has no qualified refrigeration mechanic on the staff.

Equipment selected is 14 hermetically sealed refrigeration circuits, each 5 hp in size and including compressor, motors, condensers, expansion units and piping for fluorinated hydrocarbon refrigerant No. 12, and the cooling and dehumidifying coils. A single 10 hp pump supplies 86 F condenser water from a 3 hp forced draft cooling tower. Air distribution is by means of a 10 hp fan.

The hermetically sealed sections are arranged in two banks of seven circuits each. This machinery is on the second floor, surrounded by hotel rooms. The cooling tower and pump are in the garage on the ground floor.

The 14 circuits are controlled by a step controller which starts and stops the units in pairs, providing seven steps of capacity reduction. With this step capacity we can provide the most desirable temperature-humidity relationship, with correspondingly reduced kilowatt input when the system is operated at less than design load. Controls provide sequence accelerating starting in increments of approximately 14 percent and intervals of 40 seconds to provide the very lowest possible starting inrush.

The walls and ceiling of the entire equipment room are lined with 1 in. insulation tile to provide acoustical treatment for this machinery. Evidence of the low noise level is the lack of complaints from the surrounding hotel rooms.

The hotel had an existing blower that supplied ventilation air to the old dining room. Fortunately, this fan and part of the existing ductwork could be re-used. To use this blower, we increased the rpm from 257 to 291 to provide the 21,260 cfm required at a static pressure of 1.5 in. water gage and 7.81 brake horsepower. A new drive was installed together with a new 10 hp, 1140 rpm motor. The new ductwork was designed on 0.065 in. WG loss. Air distribution is through ceiling diffusers. A plenum was installed over the refrigeration sections and connected by ductwork to the blower. The return air enters the corridor between the sections at both ends.

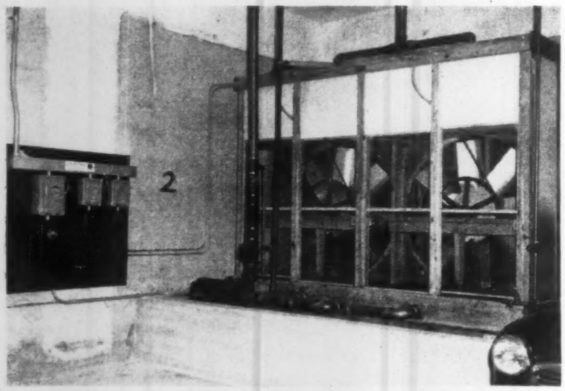
The refrigeration sections have 1 in. wood spacer strips on both sides of each unit so that there is space for removal in case of a failure. The whole assembly sits on 1 in. insulation board laid on the floor. The entire length of the plenum and the connecting ductwork to the blowers is lined on the inside with the same 1 in. acoustical insulation as the equipment room. This lining is applied with wheat paste in the same manner as wall paper.

The back panels of the sections were removed so that return air could pass through the machines and also provide ventilation for the compressors. The front panels were installed and the plenum was painted brown to give the appearance of one complete machine.

The plant is actually operated by the headwaiter of the dining room. To start the system, he merely pushes a black button on the starter box, whereupon a green light glows. He then turns a selector switch to "COOL" or "HEAT," whichever is desired, or to "OFF" for ventilation only.

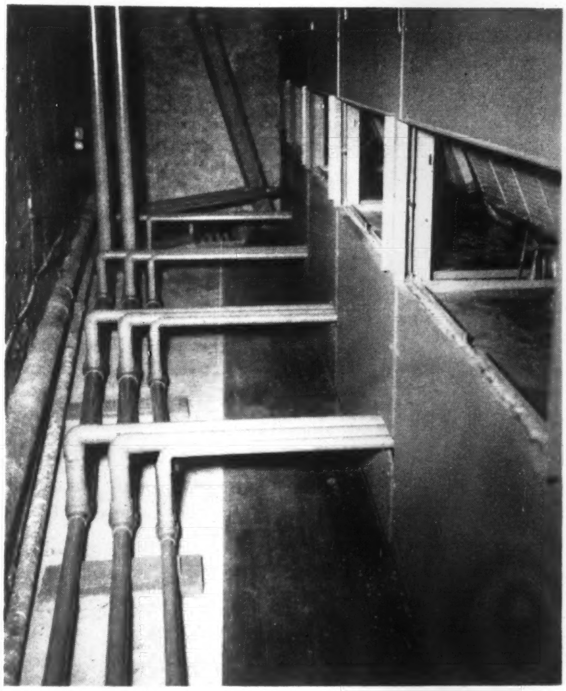
To stop the system, he pushes a red button on the starter box, whereupon the green light goes out. Then he turns the selector switch to "OFF."

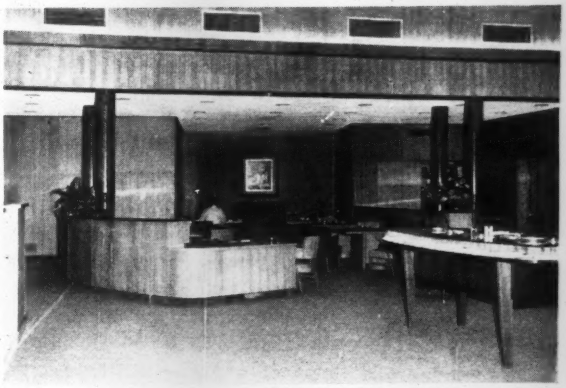
The starter box is a momentary contact pushbutton, with pilot light. This pushbutton starts the blower. The selector switch energizes a potentiometer type heating and cooling thermostat, which in turn controls a motor and a 10 stage step controller. This step controller starts and stops the compressors in pairs, and also starts and stops the cooling tower fan and pump. On the heating cycle the thermostat controls a modulating steam valve that supplies steam to a



FORCED DRAFT COOLING TOWER installed in hotel's ground floor garage supplies 86 F condenser water to 14 combined refrigeration circuits

DINING ROOM in Florida winter hotel was recently air conditioned when enlarged to seat 900 people. Air is distributed through ceiling diffusers





▲ PUBLIC AREA, as well as other bank spaces, is supplied conditioned air through diffusers via ducts from combined units

◀ 52 TON SYSTEM of nine 5 hp units in bank provides 9 steps of capacity to produce design conditions. This system replaced outmoded one scattered in three buildings

coil in the connecting duct to the blower. Steam is supplied from the hotel boiler plant.

Maintenance is very simple. Every 30 days during the operating season, our service mechanic makes a routine inspection, lubricates fan motors and pump, checks and if necessary cleans the air filters and cooling tower. To service this 73 ton plant costs the owner approximately $360 per year; a substantial savings is thus realized. The entire system cost about $46,000, including new electric service to the equipment room, and several smoke exhaust fans. If this system was built up, the cost could easily have been $55,000 or more, with only one year's warranty and about $2500 per year service expense. Therefore, an appreciable saving was experienced.

• *Combined Units Replace Old System in Bank*

A system very similar to that of the Biltmore is installed in the First National bank of Palm Beach. Through the years this bank had taken over three adjoining buildings and wanted to consolidate them into one building and banking space. The existing air conditioning was frankly a mess, with air handling units all over the place interconnected with refrigerant piping. The units were not readily accessible for servicing, suction lines were sweating, controls were damaged and disconnected, etc. The bank decided on a new central air conditioning system to be installed while the alterations were going on.

All of the old equipment was removed with the exception of some ductwork. Existing ductwork was reused wherever possible. Air distribution is through wall registers and ceiling diffusers. The equipment room, is a pie shaped space between two of the existing buildings, and is lined with 1 in. insulating tile.

We combined nine 5 hp hermetically sealed refrigeration circuits into a single unit of 52.8 total tons with nine steps of capacity to produce design conditions of 78 F DB and 55 percent RH indoors when the outside temperatures do not exceed 95 F DB and 80 F WB. A single 5 hp pump supplies 86 F condenser water from a 1½ hp forced draft cooling tower.

These sections were assembled in the same manner as those in the Biltmore except that we installed a 6 in. channel iron frame on top of the machines. This frame supports a two fan unit set on isolators. This blower is driven by a 7½ hp, 1740 rpm motor and delivers approximately 18,000 cfm. The controls are identical with those of the Biltmore except that the compressors start one at a time, and there are nine steps of capacity reduction in increments of about 11 percent.

Service arrangements for this installation are the same as for the Biltmore system and cost around $260 per year. The entire plant, including several exhaust fans but excluding new electric service, cost the owner approximately $32,000. Here again, substantial savings were made.

Advantages to the Owner

1. Lower installation cost as compared to the builtup type of central system.
2. Low operating costs due to the step capacity with reduced kilowatt input.
3. Service is held to absolute minimum. One or even two of the hermetic sections could fail without interrupting the operation of the plant. The owner would still have 80 or 90 percent capacity.
4. The hermetically sealed refrigeration circuits are covered by a five year factory warranty, which alone could possibly save the owner thousands of dollars.

Advantages to the Contractor

1. Highly skilled refrigeration personnel are not necessary for assembling this type of equipment. Men of normal intelligence can do it with proper supervision, freeing experienced mechanics for testing, adjusting, and servicing.
2. If one of these sections fail, it can be removed and a replacement quickly installed. The removed unit is then returned to the factory for repairs.
3. The stock of spare parts is considerably lower.
4. The risk of dirt, moisture, gas leaks, oil return, seal leaks, and other difficulties is eliminated.

Our test and final check figures for this installation are as follows:

Outdoor DB: 80 F
Indoor DB: 75 F
Outdoor: WB 70 F
Indoor WB: 64 F
Water in tower basin: 82 F
Water on tower: 92 F
Air quantity through tower: 24,000 cfm
Blower rpm: 560
Entering air: 76 F DB, 67 F WB
Leaving air: 55 F
Last outlet air: 59 F
First outlet air: 57 F
Total air delivered by blower: 18,237 cfm
Outdoor air: 5,697 cfm
Return air: 12,540 cfm

All of the above figures were compiled while the bank was in operation, with a people load, lighting and electrical apparatus load, and a ventilation load. ‡

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22 Zones Solve Comfort Problem in New Glass Bank

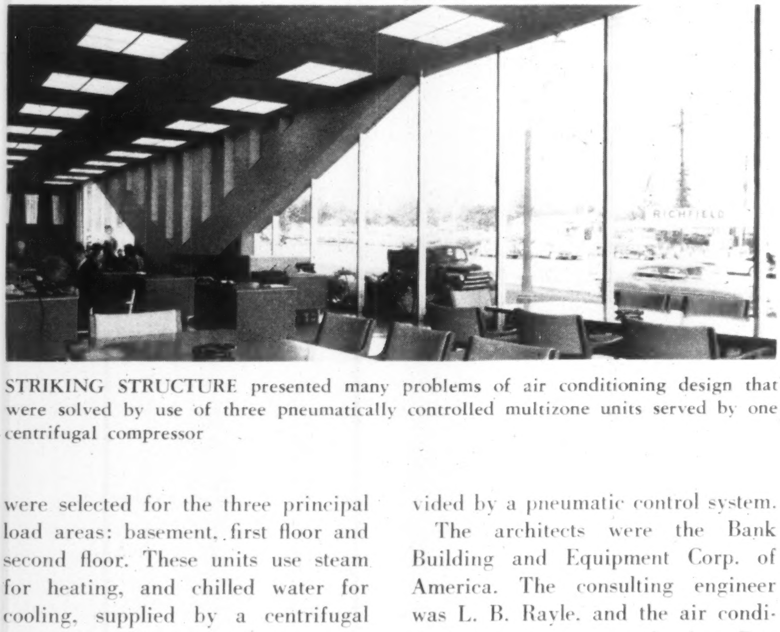
. . . with three principal load areas

THE STRIKING construction of the new Great Western savings and loan building in Los Angeles presented many heating and cooling problems.

Gaining its principal support from the tips of four inverted trusses, the building seems supported almost entirely by glass.

The problems were: the many huge window areas, exact building orientation to minimize sun loading, large general offices with multiple exposures, smaller executive offices throughout the building, space problems for location of equipment, varying occupancy in the three principal load areas, and the Southern California climate which may well require heating in one part of the building and cooling in other parts.

Multizone air conditioning units were selected to solve these problems. Three units delivering a total of 48,000 cfm of air to 22 different zones were selected for the three principal load areas: basement, first floor and second floor. These units use steam for heating, and chilled water for cooling, supplied by a centrifugal compressor. Zone temperature control throughout the building is provided by a pneumatic control system.



STRIKING STRUCTURE presented many problems of air conditioning design that were solved by use of three pneumatically controlled multizone units served by one centrifugal compressor

The architects were the Bank Building and Equipment Corp. of America. The consulting engineer was L. B. Rayle, and the air conditioning contractor was the Arm Ray Corp. ‡

Sam Lewis' Page

Confessions of a Consulting Engineer

. . . some air conditioning design bloopers which the author would avoid if he were to do the jobs over again

"BE SURE your sins will find you out" is a saying that applies to a number of heating, piping, and air conditioning systems I have designed. In not a few cases installation bloopers have been beyond my control.

• In one, for example, I was called to an air conditioned large office building of an electric service company in which an exhaust fan had not been installed. The occupants could not get warm and they could not get cool.

I found it very difficult to open any door that swings inward. I also observed that all outward swinging doors had powerful hydraulic mechanisms to hold them shut. Adding some gravity roof ventilators and some holes in the flue pipe permitted the escape of pent-up air and made me a bunch of lifelong friends.

• Once I installed a refrigerated cooling system in a five story private general office of a big corporation. I merely cooled the air of the original copious ventilating system, using the original fans, ducts, and outlets. Originally the spent air escaped through ventilators above the attic. After the cooling system went to work, the employees complained of odors.

On visiting the attic on a hot summer day I was surprised to observe that, whereas in winter a gale of smelly air escaped through the roof ventilators, no air was departing through them on this afternoon.

Evidently the supply fan was unable to force the much heavier cool air up and out of the building into the very hot expanded outdoor atmosphere. I then realized why, as each successive story above the first was examined, the cooling and ventilation were less and less effective.

We took steps, of course, to install exhaust fans and to build an adequate return air shaft from them back to the supply fans.

• I observe that those cooling plants which have the fans and cooling surfaces above the spaces which are to be cooled, seem to get along better than those which have the cooling convectors and fans below the spaces to be cooled. It seems to be far easier to blow warmed air down to the occupied spaces in winter than to blow cool air up to them in summer.

These observations and experiences led to an ambition, when using refrigerated cooling, always to install an exhaust fan in cooperation with a supply fan and to arrange interlocked dampers which would keep a definite relation between the area of the outside air intake, outboard exhaust, and recirculation passages.

These observations led also to my advocacy, in all studies and hearings concerning the new air conditioning code of the American Society of Heating and Air-Conditioning Engineers, and concerning the new Chicago ventilation code, of insistence on outside air intakes, free area through filters, convectors, and ducts, and outboard exhaust capable of passing 100 percent of outside air.

During every season there are a great many days when the outside air condition is adequate to permit ventilation and comfort without any refrigeration, if only the plant is designed to take full advantage of the condition of the outside air.

In a regrettable number of plants, because of failure to design for 100 percent outside air, large power bills for refrigeration are incurred unnecessarily. I found one recently where a 150 ton refrigerating compressor was running while the outdoor air temperature was 50 F.

• Back in 1929 I designed a certain large general office cooling system. There were several private perimeter offices occupied by elderly executives.

The interior floor areas were crowded with employees. Electric lights were used all day long. The resultant cooling load required a very low supply air temperature for this space.

In this case, I made the mistake of supplying the private offices from the ends of the concealed ducts which served the general spaces. I tried to provide comfort in the private offices by reducing the volume of the air sent to those rooms. However, these rooms were still too cold.

Before I escaped, every private office was equipped with a duct reheater of the electric resistance type, each under control of a room thermostat. ╪

SAMUEL R. LEWIS, *consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping, and air conditioning problems.*

District Heating Steam Sales Increase 6.3 Percent

. . . as reported at 48th annual meeting of NDHA

- **New customers use 2 million M lb of steam**
- **Basic steam rate increases in nine cities**
- **Fuel cost adjustments partially offset increased fuel prices**

BY JOHN F. COLLINS, JR.
Secretary-Treasurer
National District Heating Association

THE RECENT four day annual meeting of the National District Heating Association drew a record attendance to The Homestead at Hot Springs, Va.

Twenty-six papers, reports, and prepared discussions on various phases of district heating were presented at six technical sessions during the 48th annual meeting. At eight breakfast sessions members discussed their problems informally with others having similar duties.

Steam Sales Gain

The statistics committee and the sales development committee of the association compile and report figures each year showing the growth of the industry. The figures for 1956 of the former committee, headed by Foster L. Stephens, Allegheny County Steam Heating Co., Pittsburgh, Pa., show:

1) A gain of 6.3 percent in total steam sales of 54 utilities over 1955. This is attributed to an increase in degree days of 0.8 percent, an increase in connected radiation of 1.6 percent, and a decrease in steam loss, possibly by better metering efficiency, of 2.8 percent.

2) A small increase in average gross revenue of 0.7 percent per M lb of steam sold, due to the coal-cost-adjustment clauses and the increase of 4.8 percent in the cost of coal per Btu.

3) A normal growth in 1956 of invested capital of 3.5 percent; 1.5 percent being in line extensions and 1.0 percent in sendout-capacity additions, made without adding to the spare boiler capacity.

4) A decrease in 1956 of 0.6 percent in the number of customers served, and of 0.4 percent in the number of billing meters over 1955. On the other hand, the heated volume was 1.4 percent greater. The explanation is that small buildings were replaced by larger ones.

Among the 14 largest steam utilities each having total steam sales for 1956 of over 1 million M lb, the Philadelphia Electric Co. advanced from fourth to third position by increasing its annual sales by 369,000 M lb.

FOSTER L. STEPHENS, Allegheny County Steam Heating Co., chairman of the statistics committee, reported greater steam sales

Get New Customers in 32 Cities

Sterling S. Sanford, The Detroit Edison Co., a member of the sales development committee, reported the new business activities of steam utilities in 52 cities during 1956. He said that in 32 of these cities where additional customers were secured, the total new customers were 447, fewer than in any year in the past decade.

However, the estimated annual steam use of the new customers is 2 million M lb per year and the annual revenue from them $2.5 million. These latter yearly figures are by no means the lowest for the decade, indicating that the average customer secured in 1956 is larger than in some previous years.

The average rate of $1.25 per M lb is $0.10 higher than for the previous year.

Mr. Sanford found that 21 percent of the new customers had been served at some previous time and were

STERLING S. SANFORD, The Detroit Edison Co., a member of the sales development committee, reported on new business activity

returning as customers; 56 percent were in old buildings that had never before had service; and 23 percent were in new structures.

The committee further divides new customers into six groups according to building use. One hundred nine new office buildings, 90 new stores and restaurants, 79 residential buildings, 79 manufacturing and storage buildings, 58 miscellaneous buildings, and 32 assembly type buildings were connected to the lines of the steam suppliers in 1956.

In 12 cities, revenue from new business increased over 1955, while in 28 cities it was less.

Mr. Sanford reported a loss of 59 customers in 15 cities, the corresponding revenue loss being $237,000.

The committee investigated system capacity. In six cities the boiler capacity is insufficient to serve additional customers, and in none of these cities is it planned to add capacity in the current year. In six other cities the utilities have only a limited additional capacity available. In the remaining 40 cities the boiler capacity is adequate. In three cities the boiler capacity was increased in 1956 and in three others plans are under way to increase it in 1957.

Distribution facilities are not sufficient in two cities to add new customers. Ten cities have capacity for limited additions. In 40 cities the distribution facilities are adequate. In 1956, 14 cities increased distribution facilities and 14 others plan increases in 1957.

Fuel Clauses Assist Suppliers

The association rates and regulations committee under the chairmanship of Clifford O. Thurlow, rate engineer of the Commonwealth Services, Inc., Jackson, Mich., made the customary annual review of steam rates early in January.

Mr. Thurlow reported that basic steam rates were increased in nine communities in 1956. The percentages of increase ranged from 5 to 15 percent except that in one instance the increase was approximately 26 percent. One utility reduced its rates for use in excess of 3000 M lb per month, the equivalent of about 10 percent of the basic rate charge. However, as a percentage of the total charge, including the fuel cost adjustment, the reduction was only about 8.5 percent.

For the 57 communities for which direct comparison could be made, analysis of the effect of fuel cost adjustment provisions included in rates showed that their application resulted in increased total charges per M lb in January 1957 as compared to January 1956, thus partially at least offsetting increases in operating costs due to higher fuel prices.

In five communities lower fuel costs prevailed in January 1957. The operation of fuel cost adjustments in these places resulted in reductions in the total charge per M lb.

Mr. Thurlow pointed out that fuel cost adjustments in themselves are inadequate to assure fully compensatory rates for steam service due to today's increased cost for plant additions and replacements, labor and other expenses.

He said that in the past five years, companies operating in about 40 percent of the communities included in the survey have increased their basic rates to offset increases in cost other than for fuel. In 35 percent of the cities, the steam supplies have had no increase in basic rates for from 5 to 10 years and, strange as it may seem, in 25 percent of the cities the utilities supplying steam service have had no increase in more than 10 years. Two rates have been in effect since the 1920's. Mr. Thurlow recommended more frequent reviews of rates.

Steam Losses Not Reported

No formal report on steam losses was made this year by Robert C. Wilson, Ohio Edison Co., Akron, chairman of the steam losses committee. But a very successful informal breakfast and discussion period was held during which plans were made for attacking the problem of losses.

The past presidents committee under Vernon J. Suche of the Union Electric Co., St. Louis, its chairman, recommended against the formation of an accounting committee and suggested that such problems be referred to the existing commercial relations committee.

Membership Shows Substantial Gain

Walter M. Gillespie of the Dayton Power and Light Co., in his final address as association president, said the organization is operating well within its budget. He said that the 26 reports, papers, and discussions forming the program for the six technical sessions were nearly all on subjects which member utilities had requested be studied.

He reported a substantial increase in membership, especially among colleges and universities, had resulted from the untiring efforts of membership chairman, Fred W. Deutsch of Builders-Providence, Inc., and his active committee. He said that in the future membership rosters would be published as separate booklets. He said that the educational committee under David W. Loucks, Allegheny County Steam Heating Co., Pittsburgh, Pa., after several years work, had completed an operating manual for the association.

Secretary-Treasurer John F. Collins, Jr., presented a detailed picture of the organization's finances. He reported that the proceedings of all previous annual meetings had been released. Several years ago the association was several years behind in this activity.

Haroldson Elected President

John C. Haroldson, vice president and treasurer of the Duluth Steam Corp., was elected president of the association by unanimous ballot at the closing session; William G. Gillim, assistant superintendent of customer service of the Consolidated Edison Co. of New York, Inc., became first vice-president; George F. Prestwich, superintendent, coal bureau and steam heating division of the Philadelphia Electric Co., was made second vice-president; and Albert F. Metzer, supervisor of steam utilization, Allegheny County Steam Heating Co., Pittsburgh, Pa., succeeded to the third vice-presidency.

Three new directors were elected for two year terms. They are Henry W. Angelery, president of Aerco Corp., Northvale, N.J.; James C. Thompson, heating sales engineer, Georgia Power Co., Atlanta, Ga.; and Robert C. Wilson, supervisor of steam sales and distribution, steam heat department, Akron Div., Ohio Edison Co.

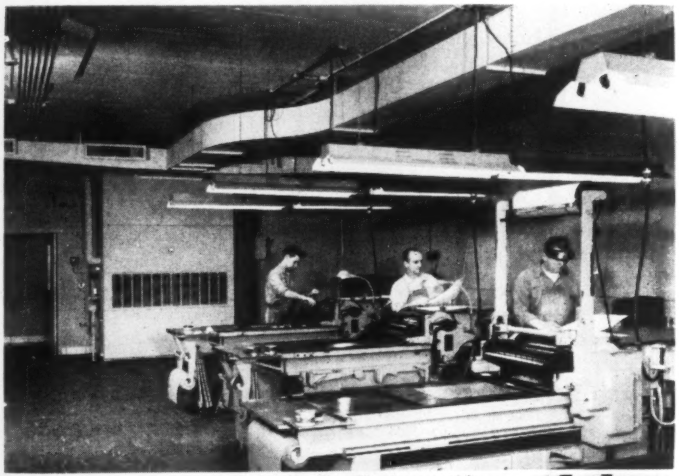
Five other directors — past president Walter M. Gillespie, Secretary-Treasurer John F. Collins, Jr., Albert A. Casey, John D. Lemon and Leroy H. Plum — continue in office.

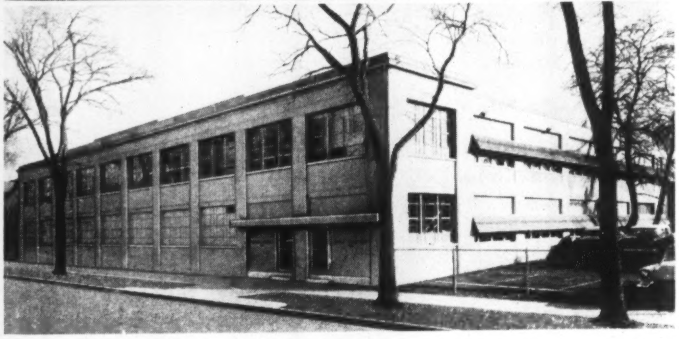
Secretary-Treasurer John F. Collins, Jr., who has held that office for 18 years, was made an honorary member of the organization. ǂ

Reports on the technical papers presented will be published in a future issue of HPAC.

Nine Package Units Condition Engraving Plant

. . . first of its kind in the Midwest





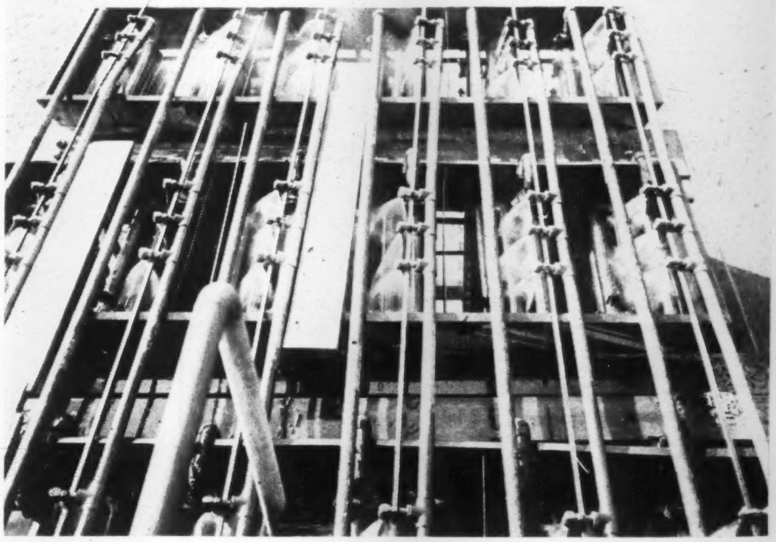
THE FIRST fully air conditioned photoengraving plant in the Midwest is this remodeled two story building in Detroit, according to the American Blower Corp. It is occupied by Cadillac Color Plate Co. and its gravure affiliate, Intaglio-Cadillac Co., Inc. The two firms occupy a total of 3000 sq ft of floor area.

The total cooling load of the building is 1,287,700 Btu per hr, peak.

The air conditioning system consists of nine packaged commercial air conditioning units plus ductwork, allied exhaust fans, humidifiers, and preheat coils, and a condenser water cooling tower. The package units, which total 107½ tons, include: one 5 ton unit; one 7½ ton unit; two 10 ton units; and five 15 ton units.

The temperature and humidity conditions maintained are: 80 F dry bulb temperature and 50 percent relative humidity in offices; 78 F DB and 50 percent RH in process areas; and 70 F DB and 52 percent RH summer and winter in the etching room. With this exception, the air conditioning system does not operate year 'round. In one department temperature is held constant with ± 2 F and relative humidity within ± 2 percent.

The humidity conditions are maintained in winter by a steam jet humidifier in the unit, and in summer by compressor operation with electric reheat. The building is heated by auxiliary finned tube radiation. Steam is supplied by gas fired boilers. Air circulation is provided by the air conditioning units. ǂ



Plastic Piping in Spray Cooler Resists Acidic Atmosphere

. . . of corrosive gases at sulfur removal plant. Solvent cement joins 2 in. diam fittings and 2 in. headers; 1 in. nipples are threaded

BY H. M. McDANIEL
Republic Steel Corp.

A TRIAL INSTALLATION of plastic pipe in an actifier water cooler constantly subject to corrosive atmosphere is still like new after three years. Actually, the plastic piping system has operated only a short time during this period. However, exterior corrosion is the big problem and was the main reason for the installation.

The cooler serves a sulfur removal plant. Hot coke on a nearby platform is quenched with water, enveloping the entire area in steam saturated with hydrogen sulfide and hydrogen cyanide. Other piping in the cooler became irreparably damaged after six months' service and had to be replaced. Each year the repair bill got bigger.

The entire plant is currently being repiped with 2 and 6 in. diam plastic pipe.

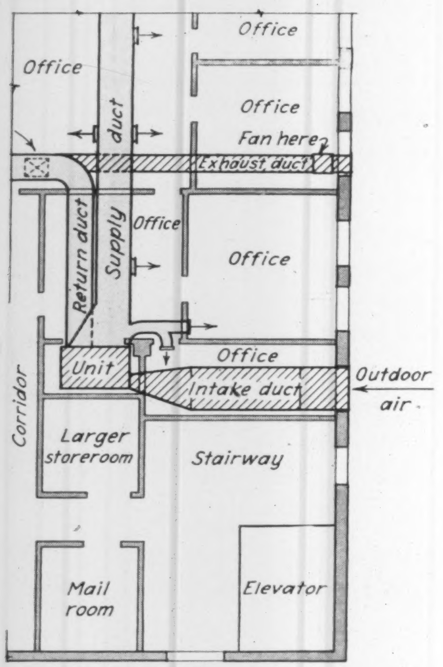
The cooler's plastic pipe header lines are 2 in. in diameter, with 1 in. diam nipples to the spray nozzles. The 2 in. diam fittings are solvent welded, and the 1 in. nipples are joined by threading.

There are nine nipples and sprays on each 2 in. header. They are supported by resting the nipples on 1 in. square bars, the full length of the header. No clamps or solid fastenings are used because of expansion and contraction of the line.

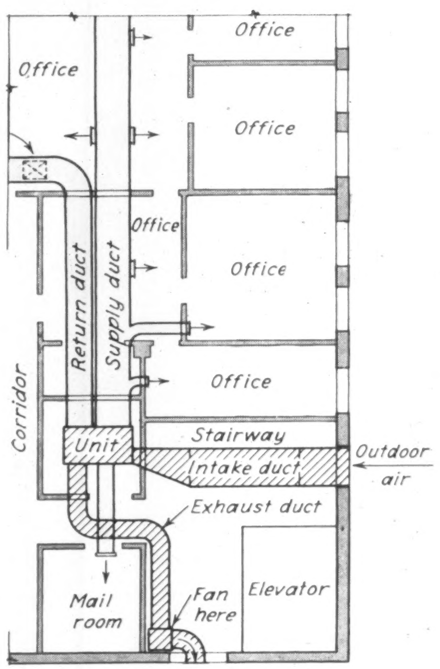
The velocity of the water through the 2 in. header pipes is 148 fpm. Through the 1 in. spray, the velocity is 16.5 fpm. The temperature of the water is between 68 and 97 F. The water pressure is 55 psig.

The plastic pipe is highly resistant to corrosive liquids and gases. It is quickly and easily joined by simple solvent welded sleeve type fittings. ╪

Before —


Office
Office
Office
Fan here
Exhaust duct
Supply duct
Return duct
Office
Office
Unit
Office
Intake duct
Outdoor air
Corridor
Larger storeroom
Stairway
Mail room
Elevator

After —


Office
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Return duct
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Corridor
Unit
Stairway
Intake duct
Outdoor air
Exhaust duct
Mail room
Fan here
Elevator

Change in location of air conditioning unit . . . .

Improves Duct Layout

. . . . and leads to many other advantages when installing 15 ton system for an office space. Example shows importance of careful study of design of even the smaller jobs.

IT'S OBVIOUS — and it's good practice — that use of the space by the occupants must be given careful consideration when air conditioning is installed in an office or other area. The compressor unit and fans should be located and installed so that noise from them doesn't become a problem. Ductwork should not mar the appearance of the space, and should not reduce headroom or ceiling heights unreasonably. This often requires considerable ingenuity when installing air conditioning in an existing building — but it's all part of the job of the air conditioning engineer and the air conditioning contractor.

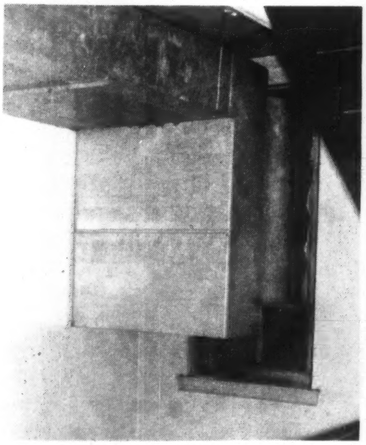
Careful planning of equipment and duct locations is done as a matter of routine on the bigger air conditioning installations. But it is too often neglected entirely, or given too little attention, on many of the smaller jobs.

As a case in point, consider the 15 ton air conditioning system installed last year to serve a typical office suite comprising some 4000 sq ft of floor space on an upper floor of a 16 story building. The original duct layout and package air conditioning unit location were — fortunately — changed before the job was actually installed. These changes demonstrate two or three points that should be remembered when an installation of this kind is being considered.

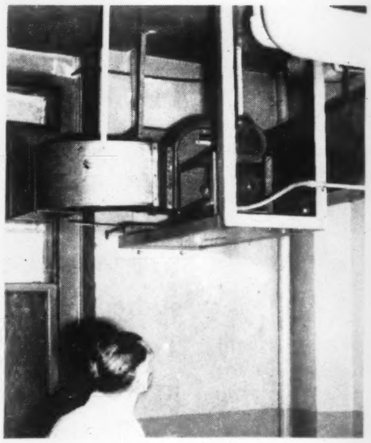
Many Objections To Scheme

At one end of the roughly L-shaped space that was air conditioned, there is a small storeroom in which there was a lavatory. This seemed to be a good spot to place the water cooled condensing and air handling unit — partly because of the convenient plumbing connections. Therefore, the original layout showed the 15 ton unit located in this store room.

As the doorway was too small to get the unit into the room, it was proposed to install new double louvered doors between this equipment room and the adjacent



OUTDOOR AIR INTAKE DUCT was run across the ceiling in stairwell in the new layout



SUSPENDED EXHAUST FAN and its duct were taken out of the office space entirely

CONDITIONED AIR is supplied to mailroom through a duct running across a corridor ceiling

office area. These louvered doors posed a noise transmission problem.

Locating the unit in this space meant also that the comparatively large outdoor air intake duct would run across the ceiling of another office space also adjacent to the storeroom. This office — used by three occupants — was long and narrow and already crowded. Running a duct of this size across it, the duct being almost as wide as the office, would have reduced the ceiling height to about 7 ft. It was felt this would make the office more like a prison cell than a comfortable working area.

Another objection to the layout was the exhaust duct. According to the plan, this fairly small duct was to run across the ceiling of yet another office to an outside wall. This would have been satisfactory, except for the exhaust fan — which was to be mounted on a suspended platform in a private office, and practically on top of the office's occupant.

The equipment location and duct arrangement as originally drawn up are shown in the first sketch.

A simple change in the location of the air conditioning unit not only got rid of all these objections; it facilitated the installation work also. It's something to remember on any proposed air conditioning installation. What appears at first sight to be the best location for the major equipment may lead to other difficulties, and possible other choices should be carefully studied.

In this particular case, there was another and larger storeroom immediately adjacent to the one first chosen for the air conditioning unit. It was cleared out, new shelves were built in the first storeroom, and little if any effective storage space was lost.

Change Improves Layout

With the new location for the air conditioning unit, there were several advantages. Most important, the large outdoor air intake could be relocated on the ceiling of a stairway, where there is more than enough headroom. Next, the small exhaust duct with its fan could be moved out of the office space entirely and into space near the freight elevators, where any noise it makes is completely unobjectionable. This put the air exhaust outlet on a different building exposure from the air intake, also an advantage. And the air conditioning unit itself is isolated from the office space it serves by solid walls, so any noise from it is also completely unobjectionable.

There were a couple of "incidental" advantages, too, when the unit's location was changed. It was found that the piping connections were simpler, as the supply and drain lines were found to be in the wall of the second storeroom, rather than in the wall of the smaller room where the lavatory was installed. Also, the doorway of the larger storeroom allowed access of the air conditioning unit, and so did not have to be rebuilt (as would the doorway of the first room chosen.)

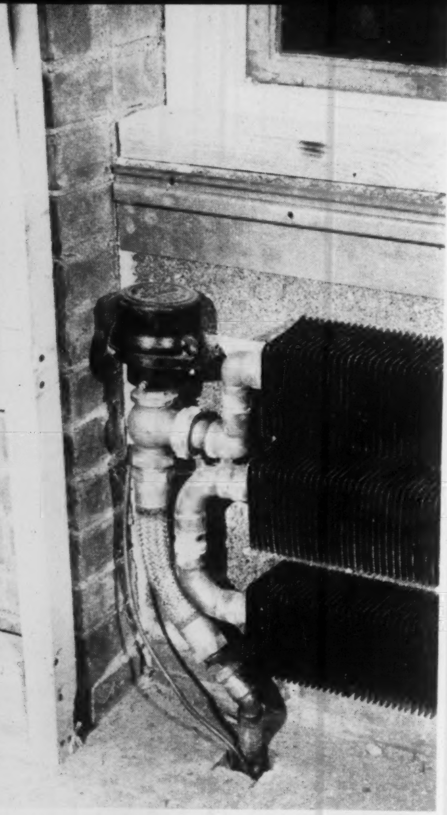
Then, too, the new location for the air conditioning unit permitted running a short duct across a back corridor ceiling to supply a small mailing room — a space needing air conditioned comfort just as much (if not more so) than the office spaces.

The new equipment room and duct arrangement are shown in the second sketch.

Careful Study Pays

The point of these comments is not to discuss the details of this particular installation. Rather, it is to show — using this one case as a specific example — that even on small air conditioning jobs, careful study of possible equipment locations and duct arrangements can lead to many advantages.

Had the installation been made according to the first scheme, the occupants of the office suite would certainly not have been as well sold on air conditioning's advantages as they are now. ⌗



Problems of providing effective classroom heating and ventilation have been solved by hot water heating and central ventilation systems installed in several new schools. Total cost of construction averaged $2.15 per sq ft.

FLEXIBLE COPPER TUBING connects hot water supply piping to convectors and also connects convectors to return piping. Connections not only allow for contraction and expansion in the pipe lines but also facilitate bends

Radiant Ceilings, Convection Solve School Heating Problems

BY E. JACKSON WHITMAN
Robson & Woese, Inc.
Consulting Engineers

PRESENT TRENDS in elementary school construction present problems entirely foreign to those of a decade or so ago. Window walls, lowered ceilings, higher foot candle values of illumination, require more effective and flexible treatment of heating and ventilation of the classrooms to satisfy modern demands for comfort and quietness.

Some of the possible solutions have been applied with satisfactory results in several new elementary schools in Western New York. The major problems resulting from modern trends are:

1) Ventilation standards set by the New York state department of education have been reduced in the interest of economy from 30 cfm per pupil to 15 cfm per pupil. For purposes of heating in cold weather, this is fine but it is hardly sufficient to do any cooling in the intermediate seasons or the hot days of spring and fall.

2) Some school heating systems cause overheating and erratic variations. Good control of temperatures is made possible by using a medium with not too large a temperature differential from the space being controlled.

3) "Night setback," the arrangement whereby economy is accomplished by lowering the building temperature when it is unoccupied, sometimes makes control systems more or less complicated, depending on the method used to produce the required results.

4) Zoning to prevent overheating some areas exposed to solar radiation usually requires additional piping and controls, often with only mediocre satisfaction due to the fact that all rooms on one zone do not have the same exposure, occupancy, or heat loss conditions.

Here's how all four problems are solved in these new schools, at a cost no higher than conventional methods.

1) Central ventilation systems, using ceiling diffusers in each room, afford the opportunity to use air of maximum temperature differential without drafts or discomfort.

By tempering outside air with recirculated air at the unit, preheat and tempering coils are eliminated. A small hot water coil in the supply duct of each room, controlled by its own room thermostat, makes each room its own zone, controllable to suit the requirements of the occupants, solar radiation, or the temperament of the teacher.

The air in the supply duct can be carried at 55 or 65 F in order to cool the rooms which are warm due to sun exposure, while the room across the hall, lacking sun exposure, can be supplied by air at 80 or 90 F at the same time. By proper sizing of equipment, the minimum amount of outdoor air will be taken into the building, consistent with designed occupancy in zero weather without requiring any heating coil in the outdoor air unit, thus eliminating any possibility of freezing coils.

Corridors are used for returning air to the central units.

2) Hot water must be circulated by pumps and, therefore, lends itself to overhead distribution. An insulating layer between the floor slab and the foundation is all that is required to keep the heat loss at a minimum on the outside walls. Radiant coils in the ceiling provide comfort to the occupants and warm floors while maintaining lower room air temperatures. All coils vent into the main so that a minimum number of air vents in the hot water system are required.

3) By designing the radiant panels to maintain a room air temperature of 60 F in the classrooms, low night temperatures are accomplished by shutting down the ventilating fans. Morning pickup is automatic when the fans are started by a time clock.

4) Automatic control functions are relatively simple. The thermostat in each room controls a valve on the reheat coil for that room. The thermostat on the outdoor air unit regulates outdoor air and recirculating air dampers to produce constant temperature air in the supply ducts. The thermostat on the boiler maintains constant water temperature of the boiler water. An outside thermostat adjusts the control points of both the radiant coil system and the reheating coil system. Temperatures in these latter systems are maintained by automatically positioning three way valves, taking only enough boiler water to maintain the desired temperature and to supply the heat needed throughout the building. Since the boilers, pumps, and the principal controls are in the boiler room, maintenance and supervision of control functions are reduced to a minimum.

The ceiling panel circulating water is carried at a temperature required to heat the rooms to 60 F. A high limit control stops the pumps when the water temperature exceeds 125 F to prevent damage to the plaster ceilings. The reheat coil circulating water is carried at a higher temperature, 120 to 150 F, to provide capacity for quick morning pickup.

The use of copper tubing has been found to eliminate many corrosion and scale problems.

Schools ranging in size from 300 to 1200 pupils have been satisfactorily heated and ventilated in this way. In the past three years, six schools, all having one story layouts with classrooms, all purpose room, cafeteria, administration, and health suites, comprising about 50,000 sq ft in area, have been built with the described heating system at an average cost of $2.15 per sq ft.

Operating fuel cost on the former has averaged about $0.75 per deg day, or an annual cost of $5300. All these schools are within a radius of 50 miles of Rochester, N.Y., and several were built by the same contractors. ≠

Churches Swing to Air Conditioning in the North

. . . various methods used

THE FIRST church in Manhattan to install complete air conditioning at the time of construction is The Church of Our Savior at 38th St. and Park Ave., according to Charles V. Fenn, vice president of Carrier Corp.'s Machinery and Systems Div. He predicted this would signal the opening of an important new air conditioning market.

The first existing churches to be fully air conditioned for parishioners in Manhattan and Brooklyn — St. Malachy's, the famous Actor's Chapel at 49th St., and The Church of the Good Shepherd, respectively — have both just installed self-contained equipment, Mr. Fenn stated.

"Air conditioning of churches all through the northern part of the nation can be expected to increase steadily, bringing to churchgoers the same comfort provided by merchants and entertainment centers," he said.

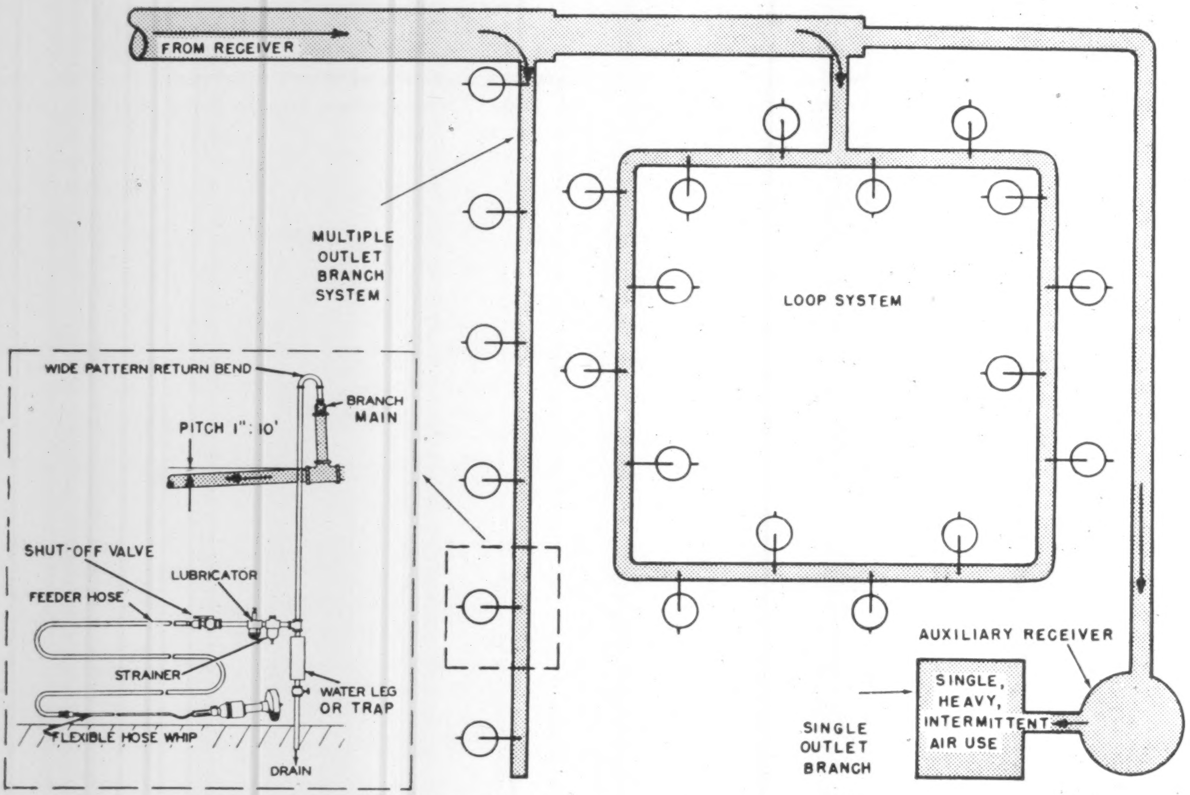
The Church of Our Savior has a seating capacity for approximately 1000 persons in the auditorium and chapel on separate floors and yet occupies a land area of only approximately 100 by 100 ft. To make possible this maximum utilization of available space without sacrificing architectural beauty, the below-street area and the steeple are used to house the air conditioning apparatus.

The cooling tower has been cleverly disguised and located in the lower portion of the spire normally occupied only by bells.

Though the automatic absorption refrigerating machine with 132 tons of cooling capacity has already been lowered into place, it will be two years before the unit is turned on, when the ornate structure is completed.

The refrigerating unit uses city steam to produce cooling. It is installed just beneath the subbasement chapel area.

The architect is Paul C. Reilly, and the consulting engineer is Syska & Hennessy. The air conditioning contractor is Jarcho Bros., Inc. ≠


FROM RECEIVER
MULTIPLE OUTLET BRANCH SYSTEM
LOOP SYSTEM
WIDE PATTERN RETURN BEND
BRANCH MAIN
PITCH 1": 10'
SHUT-OFF VALVE
LUBRICATOR
FEEDER HOSE
STRAINER
WATER LEG OR TRAP
FLEXIBLE HOSE WHIP
DRAIN
AUXILIARY RECEIVER
SINGLE, HEAVY, INTERMITTENT AIR USE
SINGLE OUTLET BRANCH

COMPRESSED AIR PIPING SYSTEM should be laid out in the form of a loop to provide two way flow to points of heaviest demand and to assure maintenance of uniform high pressure

How to Design and Maintain Compressed Air Piping Systems

. . . for efficient, economical air distribution

BY R. J. NEMMERS
Ingersoll-Rand Co.

THE SELECTION of modern, efficient air compressors, pneumatic tools, motors, cylinders, and air controls is an important part of correctly designing any compressed air system. But connecting them to inadequate or improperly designed air distribution pipe lines can nullify much of the money spent for high quality pneumatic machines.

As with any other engineering problem, design of an air power system is attacked from the standpoint of what it must do. A specific compressed air system must do a job dependent on the quantity and pressure of the air required by each user. The place to start designing a system, then, is at the point or points of use. In this discussion, an air distribution system consists of the piping and hoses between the air receiver and the actual tool.

Design of a compressor plant is a different subject. The points in this article are based on the assumption that an adequate compressor plant, properly equipped with aftercoolers, receivers, and other accessories, is used to supply air to the system.

A simple compressed air distribution system can be defined as one made up of one user served by a single compressor. A good example would be a small air operated forge hammer requiring, say, 160 cfm of air at 90 psig. Plant layout dictates that the compressor, a unit delivering 160 cfm or more at a nominal pressure of 100 psig be located, for example, 100 ft away from the forge. Design of such a system is easy: the only problem is to determine the size of the pipe required to carry

160 cfm of air 100 ft while losing no more than 10 psig by friction.

A compound system is one which must supply two or more users, either simultaneously or alternately. If the latter is the case, its design may be treated as a simple system. If air is needed simultaneously by all users, their requirements are totaled and that figure used to calculate pipe sizes. Suppose, for example, that in the same forge shop there are two forges of like requirements — 160 cfm at 90 psig. A compressor delivering at least 320 cfm is required, and the piping — say 100 ft again — must handle 320 cfm with no more than 10 psig pressure drop.

Summing the peak requirements of all users on the line is of value only up to a point. Then it becomes obvious that not all of the users will be operating at any given moment. It then is possible to take that into consideration in sizing the distribution system. In many cases certain lines can be sized for average air flow, thus reducing the cost of the system with no sacrifice in efficiency.

Determine Correct Air Flows

Average air flow may be defined as the product of (the number of users) × (their air requirements) × (a load factor or the percentage of time each tool actually is in operation). There are many ways of determining load factor, but in the final analysis it all boils down to experience. The best, of course, is past experience on the same operation, but if, say, a completely new assembly line is being tooled up, there are other wells of experience on which to draw. The first, of course, are the tooling engineers and time and motion study men. Another good one is the sales engineer representing the compressor and tool manufacturer.

The air requirements should be checked carefully. Not all tools, even of the same general type, use equal amounts of air.

Average air flow rates should be used cautiously and in the proper place in the system. Feed lines — the lines running from the branch to the tool takeoff — must be sized for maximum air flows. This is determined by summing up the maximum requirements of all tools on the line that may be operated at any one time. Branch mains also are sized for maximum anticipated air flows. It is only when main lines are reached that average air flows should be used.

Pneumatic tools in general are designed to operate most efficiently at 90 psig pressure. Since most compressors operate at a nominal discharge pressure of 100 psig, the maximum allowable pressure drop in a system for best efficiency should be no more than 10 psig, or 10 percent.

This pressure drop must be calculated from the compressor to the point of use when the tool is running. Losses in hose and hose fittings frequently are as high as 5 psig in a well planned layout. Therefore, the maximum pressure drop in piping should be limited to about 5 psig. As a general rule, limit losses in mains to a maxium of 3 percent.

Design for Future Expansion

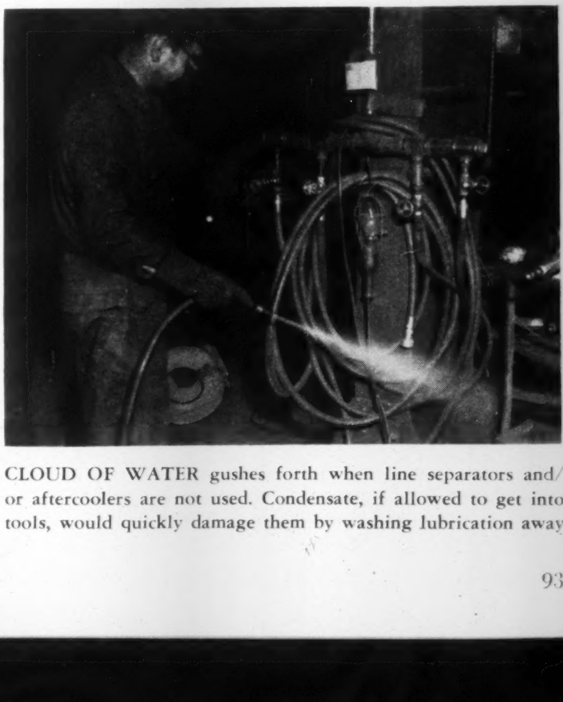
When selecting piping, thought should be given to the role air power will be expected to play in future expansion of operating facilities and the lines sized to handle anticipated loads. The fact that, during the useful life of a system, the accumulation of dirt and other deposits can cut down the carrying capacity and increase the flow resistance of pipe should also be taken into account.

There is a good economic reason for installing oversized pipe to meet future needs. Cost of pipe and fittings is only a small portion of the total cost of installation. Percentagewise, putting in a line of 200 percent more capacity than another line often will cost only about 125 to 150 percent more.

Drain Condensate Effectively

Compressed air holds much less water vapor at any given temperature than does atmospheric air, of course. Yet there always is some condensation in compressed air lines; therefore, the lines must be arranged to drain effectively. Otherwise, tools can be damaged through washing of lubricants.

Lines should drain away from the air source, that is, in the direction of air flow. A pitch of about 1 in. in 10 ft is considered the minimum. Condensate should be trapped at all low points in the system and ejected. The practice of blowing condensate from hose lines thereby is eliminated and with it the loss of air. Automatic traps which blow down when full are recommended, but it must be noted that they should be readily accessible; a great deal of air can be lost through jammed traps which are not immediately noticed. All takeoff lines should enter the top of the supply line, thus preventing carryover of condensate.



CLOUD OF WATER gushes forth when line separators and/or aftercoolers are not used. Condensate, if allowed to get into tools, would quickly damage them by washing lubrication away

Pipe Should Be New, Valves Leak-free

Pipe should be new, rated to handle the system pressure, and installed in as straight a path as possible. Used pipe is not economical when building air systems. The use of welded fittings is recommended, as they tend to remain leak-free for a long while. Long radius bends should be used: the resistance to air flow of a 1 in. diam 45 deg welded elbow is only 75 percent of that of a comparable short radius fitting.

Valves should be of a type that remain leak-free for long periods of time. Pressure tight, packingless valves, or diaphragm valves might be given consideration from an economic standpoint: will freedom from packing maintenance and air losses be enough to offset the premium cost of such valves?

Lay Out System in a Loop

Pressure losses somewhat more than the maximum listed as desirable may occur in extra long runs of pipe to a large user. This can be taken care of by installing a storage receiver near the end of the run. This acts as a reservoir for meeting peak demands and smooths out pressure fluctuations. The same idea is useful in maintaining pressure at points of high air use, say in a forge shop when several large hammers are operating.

The entire system should be laid out in the form of a loop. Smaller units should also be looped — for example, the header supplying an individual shop. This provides two way flow to points of heaviest demand and will assure maintenance of uniform high pressure in the system.

Hose takeoffs for portable tools should be spotted at frequent intervals so that excessive lengths of hose are not required to give the operator required mobility. Each such takeoff for a tool should be equipped with a small inline strainer or separator, a lubricator, and a shutoff valve. Many air tools are equipped with built-in lubricators, but in the interests of reduced weight and size, their capacity is kept at a minimum. Therefore, it is wise to install in-line lubricators for all tools. A definite, scheduled check should be set up to insure that strainers are kept clean and lubricators filled.

Hose should be sized so that not more than 5 psig pressure drop occurs in any run. Never use fittings of a smaller size — internal diameter — than the nipple provided on the tool by the maker. If long runs of hose are unavoidable, a large diameter feeder should be used with a short length of lighter hose — a "whip" — at the tool end. Hose should be kept off the floor, suspended from brackets, when not in use. If the hose must cross a vehicle roadway, protect it with a bridge.

How to Determine System Efficiency

The efficiency of any air system is merely the ratio of what is put into the system to that which is taken out. If for example, we are putting 100 psig air into a system, but find in checking the pressure at a tool, when the tool is running under full load, that we are getting only 60 psig out of the system, then 60/100 × 100 = 60 percent efficiency.

If a loss of about 10 percent was the maximum allowable and our sample system has a loss of 40 percent, obviously something is wrong. We are either losing too much air, using too much air, or restricting the flow of the air so much that 40 percent of the power we have produced in the compressor is being lost.

The next problem, then, is to find which of the latter faults is the case. But first we should set up some criteria for other systems and list the methods used to determine the basis for comparison.

1) Record the air pressure at the main receiver several times during periods of heaviest use. All gages used should be calibrated and pressures corrected for gage error.

2) Simultaneously record the pressures at the ends of branches.

3) Also at the same time note the pressure at individual tools when the tools are running under full load. A needle air gage that punctures the hose, yet does not leave a leak, is handy for this.

If the pressure at the receiver is less than 100 psig, too much air is being used or lost, more compressor capacity is required or leaks must be fixed. If it is 100 psig, then the pressures recorded in (1) and (2) should not differ by more than 5 to 7 psig; those in (1) and (3) by not more than 10 to 12 psig.

If those losses are exceeded, the chances are that more money is being wasted through loss of production than a complete revamping of the air system would cost.

How Much Air Is Going In?

Before we can determine how much air is being used and how much is being lost, we must find out how much is going into the system. To do this, record, during several peak intervals, the time compressors run at full load, each degree of part load, and no load. A recording or curve drawing wattmeter or ammeter is of great aid in this job because the time at each condition will be shown clearly. From that data and the compressor ratings — actual deliveries, not piston displacements — calculate the average volume of air now being used.

How Much Air Is Being Lost?

Calculate, as before, the average amount of air being produced by the compressor, but do it at a time when no air is being used for production in the plant, such as over a weekend or on a noon hour shutdown. System pressure, of course must be maintained. This is the amount of air which is being lost through leaks. Divide it by the output obtained previously, and multiply by 100 to get the percentage of efficiency.

If the loss is less than 5 percent, the system is in good shape. If between 5 and 10 percent, the situation isn't critical, but maintenance forces should be alerted to check closely for leaks. And if the loss is over 10 percent, go after leaks with a vengeance; real dollars are blowing out of those little holes.

What to Do About Leakage

After the tests on the system, the first thing to do is to correct any glaring irregularities. If, for example, about 15 to 20 percent of the air being compressed is being lost, this should be taken care of immediately, before proceeding with any other steps.

- Look for leaks particularly around valve stems; replace any valves needing it.
- Check automatic traps to be sure that they are working properly and not leaking air to the drain.
- Repair leaking valves on tools or other air users; pneumatic tools should not be left "live" on the line — under pressure — but often are, even when used only occasionally.
- Standardize on good commercial blowguns; home-made types using globe valves very often develop leaks or are not shut off tightly.
- Consider reducing the pressure of air used in blowguns. Doing so not only saves air, but makes them much safer in use.
- Check all hose, making sure that hose fittings are tight, that the hose itself is not split, cut or scuffed, and that hose clamps are secure. Hoses, more than any other one thing, often are responsible for a great deal of leakage.

What to Do about Low Pressure

Low pressure can be caused by leakage, so leaks, of course, must be taken care of first. Then, examining the records taken on starting the job, it is possible to pick out areas where excess friction is causing low pressure. If readings taken at the receiver and branch ends are all right, then the excess pressure drop probably is in the hoses, the chief offenders causing low pressure as well as leakage.

- Watch for spuds, nipples, and menders that are too small; never put a restriction in a hose line that is smaller than the nipple provided on the tool.
- Check to make sure that hoses are not kinked; use a hose only long enough for the job and if exceptionally long runs are required, use a large diameter hose with a short, lighter and more flexible "whip" at the tool end.
- If pressure losses are confined to mains or branches, usually examining piping diagrams and comparing them with estimated usage along the way will show up the obvious restrictions and point out overloaded lines. Keep piping diagrams handy and plot on them estimated air flows each time additional users are put on the line. Then when it appears that a line is very close to being loaded to capacity, additional piping can be planned to handle future growth.

The time to do all of these things is not after trouble is apparent, but at frequent intervals on a regularly scheduled basis. Similarly, the cost of such a program is much less in the long run. Furthermore, it represents a steady, budgetable charge. ⫩

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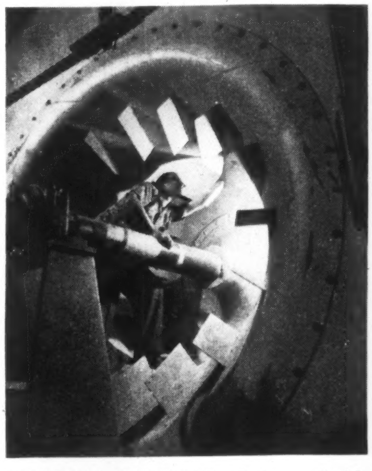
24 Big Fans Ventilate New Lincoln Tunnel

11 blower, 13 exhaust fans change air every 1½ minutes

THE NEW THIRD TUBE of the Lincoln tunnel beneath the Hudson river has a ventilation system able to completely change the air every 1½ minutes.



SERVICE ENGINEER Robert Smith checks one of the giant fans

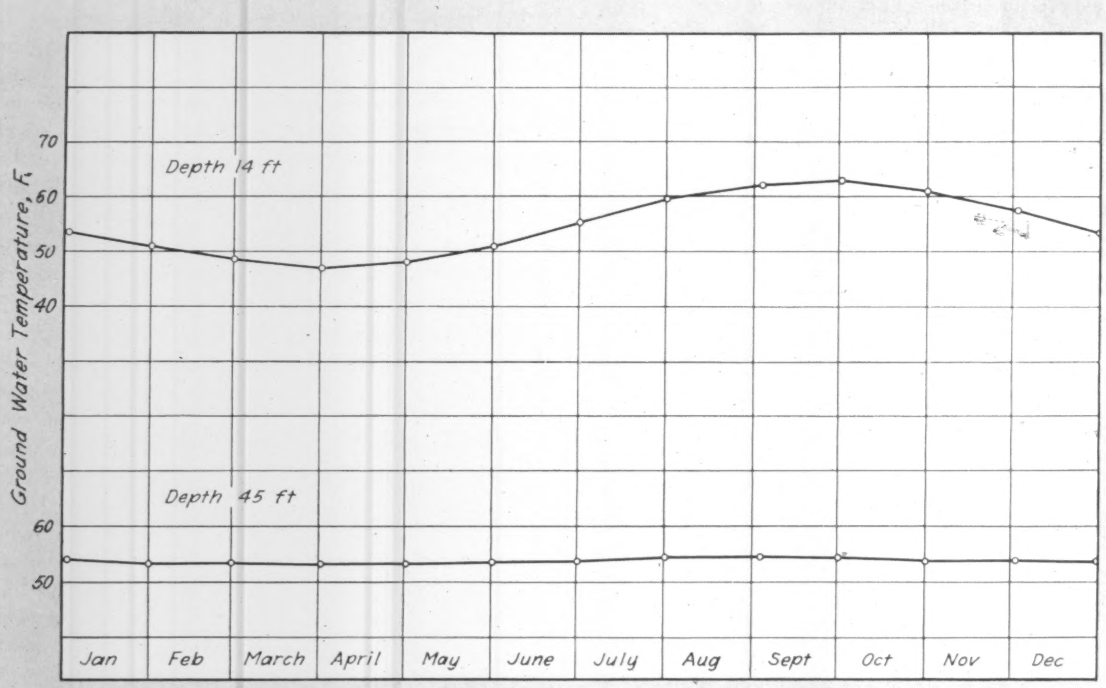
Eleven blower and 13 exhaust fans — ranging in capacity from 126,000 cfm to 320,000 cfm — maintain a constant flow of outdoor air, injecting it into the tube at roadbed level and exhausting it through openings above, according to the Westinghouse Electric Corp.'s Sturtevant Div. The fans — all of the centrifugal type — are nonoverloading, with backwardly inclined blades.

The 24 fans which ventilate the new tube, together with the 56 fans in the old tubes, are controlled from one central station. Spotted along the tube are devices to detect carbon monoxide concentrations. The position and density of these concentrations is transmitted to the operator at the control station, making it possible for him to adjust the various fans according to the need in individual areas.

Forty percent of the space in the third tube is occupied by ducts that carry air into the tunnel and discharge used air from the roof of the ventilation buildings.

Since the new tube carries only eastbound traffic, ventilation is more difficult due to the upgrade at the New York end where the vehicles emerge. Thirteen of the 24 fans are in the ventilation building at the New York side, and 11 are in a similar building on the opposite side.

Some of the fans are kept for emergency reserve and are not operated under normal conditions. Fans are automatically operated at correct speeds for ventilation to insure that carbon monoxide content is kept well within safe limits. ⫩



GROUND WATER TEMPERATURES at shallow depths are influenced markedly by the local air temperature, as shown by these monthly variations measured at the same site, but at different depths, on Long Island, N. Y.

Planning to Use Water for Air Conditioning Design?

The use of ground water for air conditioning is increasing, both for direct cooling and refrigerant condensing. Here are tips to look for and what to avoid to assure efficient, economical application. Included are where to find ground water, how to estimate its temperature, how to dispose of spent cooling water safely, and other points.

BY JOHN F. HOFFMAN
Civil Engineer

GROUND WATER TEMPERATURES measured during well drilling are not necessarily indicative of temperature conditions during the peak of the air conditioning season nor after the extensive pumping of a well. Sustained ground water withdrawals ultimately tap the ground water stored in distant regions of an aquifer or stored in overlying or underlying formations.

This water may, for one reason or another, be at a different temperature. In some cases, where the temperature of this water is higher, costly modification of the conditioning equipment might be necessary before satisfactory operation is obtained.

The maximum ground water temperature desirable for systems utilizing well water to cool and dehumidify air directly is about 57 F. Water with a temperature above this cools the air but causes unsatisfactory dehumidification. For most other cooling purposes well water temperatures should be below 90 F for efficient operation.

Where to Find Ground Water

The volume of geologic material that both contains and yields water in usable quantities, is called an aquifer. In some areas a number of aquifers exist due to the separation of water bearing beds by extensive occurrence of impermeable layers. In other areas, only a single aquifer exists.

For air conditioning purposes, wells are the best means of tapping an aquifer for its water supply. These wells may be uncased holes drilled into rock, or in the case of sands and gravels, they may be steel casings drilled or driven into unconsolidated materials. Water flows into rock wells through the exposed walls of the hole. However, in the case of sands and gravels, a well screen or a perforated casing is necessary for flow to take place. Development of a well screened in unconsolidated materials is a necessary part of the well drilling process, for it removes the finer particles in the vicinity of the screen and increases the flow of ground water into the well.

Not all water bearing materials yield water with equal facility, for water moves faster through some material than others. Permeability is a measure of the relative ease with which water can move through an aquifer. Saturated silts and clays, while storing large quantities of water, yield only negligible amounts upon drainage and therefore have a low permeability. On the other hand, sands and gravels readily part with their pore water, and, in most cases, are a good source of ground water.

A similar condition exists in rocks, for all rocks do not have the same capacity for ground water storage or transmission. Some rocks, such as shales, slates, and granites, due to their density, low porosity, and structural continuity, may not permit any ground water storage or seepage at all. Wells drilled in these rocks will probably not yield any water. Where seepage through this type of rock does take place, it is at a very slow rate and the water may become highly mineralized. Rocks such as sandstone and limestone are relatively porous, and yield their pore water readily. As a result they constitute good aquifers.

How to Estimate Ground Water Temperatures

The temperature of the ground water stored immediately below the water table, and to a depth of about 200 ft is generally within 6 F of the average annual air temperature. Precise ground water temperature measurements made in the eastern part of Long Island, N. Y., indicate that in that area, the effect of air temperature on that of ground water is greatly reduced at a depth of about 300 ft. Below this depth the ground water temperature is predominantly influenced by the earth's temperature.

In general, temperature measurements made in deep wells increase approximately in proportion to the depth to form a geothermal gradient. The earth's thermal gradient is not the same everywhere, but varies from place to place in accordance with the subsurface geology. Even within one state there can be slight differences.

When the required supply of cooling water is obtainable only at great depths, consideration of the geothermal gradient is especially important. Ground water temperatures at these depths may be too high to be usable. In such cases, it might be more feasible to use another medium for the air conditioning system.

At shallow depths ground water temperatures are influenced to a greater degree by the local air temperature. The monthly variation in the ground water temperature measured at two well points at the same site in the central part of Long Island, N. Y., but screened at different depths, is shown in Fig. 1. These wells were driven into glacial sands to a depth of 14 ft and 45 ft, respectively. The temperature of the water sampled from the shallow point ranged from 46.7 F to 62.5 F, while the temperature extremes for the water sampled from the deeper point in the same period were 53.2 F and 54.8 F.

In both cases, the lowest temperatures occurred during early spring, while the highest occurred at the end of the summer. Consequently, shallow wells drilled and pumped in the late winter or early spring may yield water having a lower temperature than that at the peak of the air conditioning season.

Therefore, to prevent inefficient dehumidification the water temperature selected for design purposes should be evaluated accordingly. Additionally, ground water temperatures in areas having a high annual air temperature may be too high for efficient cooling and dehumidification through the direct use of water. In these cases, ground water is better utilized for compressor cooling, using an intermediate refrigerant for air conditioning.

Estimating the ground water temperature underlying a site, at a selected well depth, can only be accomplished within limits. Such approximation can be made by adding to the average annual air temperature of the area a 1 F temperature rise for every 64 ft of estimated well depth. The average annual air temperature may be obtained from the U. S. Weather Bureau for any locality.

In addition to the basic influence of the above mentioned factors, the temperature of the ground water underlying a site is also subject to other influences. Primary among these are the temperature changes brought about by the movement of water from a river, seepage basin, or diffusion well into the ground water reservoir as the result of a pumping well.

Surface Water Infiltration Raises Temperature

Infiltration of water from lakes, rivers, and bays, while serving to replenish the pumped aquifers, also cause undesirable temperature rises in the ground water during the air conditioning season. Surface water drawn into the water bearing sands under the influence of pumping is mixed with the formation water in the pumped well, and the resultant water temperature depends upon the relative proportions of each water.

The mean monthly surface water temperature is generally within a few degrees of the mean monthly air temperature, when the air temperature is above freezing. In the winter, because the surface water is colder, the well water pumped will have a lower temperature than if the ground water were the only source of well water. In the summer, the reverse condition is true, and the well water pumped may undergo a temperature rise of sufficient magnitude as to seriously interfere with the dehumidification function of an air conditioning system.

The well water temperature of public water supplies pumped from the water bearing sands adjacent to the Ohio river, at Louisville, Ky., and depending, in part, upon infiltration from the river ranged from 47 F to 64 F throughout the year. The temperature of the river water during this period ranged from 32 F to 85 F. Further down river at Parkersburg, W. Va., the temperature of the Ohio river water ranged from 33 F to 82 F, while the well water temperature measured at the public supply well field ranged from 45 F to 67 F.

The amount of surface water infiltration into the ground water reservoir is dependent upon the rate at which the well is pumped, the hydraulic characteristics of the aquifer, the distance of the pumping well from the surface water body, and the amount of vertical seepage from precipitation or leakage from other aquifers recharging the pumped aquifer. In general, an air conditioning well should be as far from a river, lake, or bay, as feasible. If this cannot be done, screening the well at a greater depth below the bed of the river than would ordinarily be required, or placing the screen beneath extensive layers of low permeability helps to reduce the rate of infiltration.

How to Safely Dispose of Spent Cooling Water

Recharge of spent cooling water in the vicinity of the supply well can create a troublesome temperature problem. Whether done as a requirement of state conservation laws, as on Long Island, N. Y., or as an economy measure to avoid costly sewer taxes, piping, or sewer connections, recharge of spent cooling water to diffusion wells or seepage basins places in the proximity of the pumping well a large volume of warmed water. In Kings county, in the western part of Long Island, localized temperature rises of as much as 20 F have been noted.

Recharge basins are rectangularly shaped excavated pits designed to recharge waste water from supply wells, storm sewers, or drains to the permeable sands underlying the area. The basin volume permits large quantities of water to be discharged to it during relatively short periods of time, storing the water during the slower seepage process.

Recharge wells are similar in construction to supply wells; however, the open area of the well screen is at least 25 percent greater. These wells, which may be drilled into either rock or sand, are compact, require relatively little space, and are more cheaply maintained. A more recent approach has been made to transfer the installation of diffusion wells from the well drilling field to the construction field. A leaching chamber type of diffusion well has been designed which utilizes slotted concrete leaching chamber sections surrounded by a pea sized gravel packing.

Due to the pattern of ground water flow toward a pumping well, part of the recharge cooling water may return to the supply well and mix with the cooler water from other parts of the aquifer. Markedly increasing the pump capacity of a well installation to cope with an increased air conditioning load may increase the amount of spent water recirculated and thereby introduce a serious temperature rise in the water pumped. Recirculation of this spent cooling water cannot be prevented entirely, but maximum separation of the well screens, both horizontally and vertically, and the recharge of the warmed water down gradient from the supply well helps to minimize the effect.

Shallow wells too close to basins that recharge storm water may show excessive temperature rises during summer months. Recharge of large volumes of storm runoff during these times, superimposes a sizeable layer of warmed water on the cooler ground water held in storage and a mixture of the two is pumped. Such a well, if drilled and pumped during the winter months, would probably show a favorable temperature characteristic but would prove troublesome during summer months experiencing sizeable amounts of precipitation. The effects of this recharge may be minimized as in the case of surface water infiltration.

Don't Overlook Miscellaneous Factors

Extreme ground water temperatures occur in the vicinity of steel mills, cold storage warehouses, and other areas where plant processes depend upon either a very low or very high temperature.

Temperatures of the well water pumped from the Duquesne, Pa., municipal supply wells, adjacent to a large steel plant, have been known to exceed 100 F. Ground water temperatures of this magnitude preclude its use for air conditioning purposes.

Cold storage warehouses, on the other hand, lower the temperature of the ground water, thereby increasing its capacity to absorb heat. Cold losses from these buildings are of sufficient magnitude, that to prevent frost heave of the foundation, the depth to water underlying the site of these buildings must be greater than 10 ft.

As the ground water temperature increases, its usefulness as a coolant decreases, until a temperature is reached that requires remedial measures before further use can be made of well water. These measures may include chilling the water with refrigeration or relocating the supply well in accordance with the above suggestions. Where a water supply is inadequate due to its temperature, quality, or quantity, it is sometimes possible to recharge a sufficient quantity of silt free cold water from a river or lake during the winter months for use during the following air conditioning season. ‡

The Law and Your Profits

BY WILLIAM HURD HILLYER

Prime Contractor Obligated

. . . for past due bills of sub-subcontractor, says court

COSTLY SNARES may entrap the unwary when contractors hire subcontractors and these in turn hire sub-subcontractors, as the following case shows.

The May-Jestick Co. — to air condition a building they owned — agreed to purchase cooling equipment from Koald, Inc., which thereafter engaged Hyper-Borean Co. as subcontractors to install certain units.

Hyper, in turn, contracted with Abel N. Willing to do the actual work. He did so and billed May-Jestick Co. for $641, which was paid after Willing obtained a judgment for the sum.

Before the judgment was granted, May-Jestick forwarded Willing's demand to Koald, Inc., who replied that Hyper-Borean was responsible for the bill, because the supplying and installation of the equipment was a subcontract between Koald and Hyper. Willing had named Koald, Inc., as party defendants, but at the original trial his suit was thrown out so far as Koald was concerned. However, the judge made it plain that his "non-suit" was not an adjudication of the issue.

Evidence revealed that the agreement between the owners and the air conditioning contractor placed upon Koald the burden of not only furnishing the equipment but also installing it — and for a specific price which the owners paid to the air conditioning contractor.

When May-Jestick appealed, the second court analyzed the situation thus: Koald agreed to sell — and at its expense to install — on May-Jestick's premises certain cooling equipment. So far as the building owners were concerned, Koald carried out that agreement, Mr. Willing doing the work of installation. The contract was completed and no breach thereof occurred. Nevertheless, Willing was able to obtain a judgment against the owners. But the latter was forced to pay money to Mr. Willing which "ought to have been paid by Koald." The court therefore adjudged that Koald was "obliged to repay the money as laid out."

The air conditioning contractor appealed to a higher court, contending there was no evidence that the amount paid by May-Jestick was the reasonable value of the work. However, the court cited evidence that if all equipment itemized in Mr. Willing's statement had been necessary for the job, the charge was not unreasonable. Consequently the court affirmed the lower court's judgment, against the air conditioning contractor.

Koald's actual plight, as to the money end of this contract, does not appear on the record but is deducible therefrom. If, as he contends, he contracted with Hyper for the installation, he might have paid Hyper-Borean despite the fact that Hyper had not paid Willing. In such event the affirmed judgment would leave Koald some $600 out of pocket, which he might or might not recover at law.

The fact that Willing's claim against Koald had been non-suited could not be urged in Koald's favor.

Recent court records abound in cases involving respective liabilities of contractors, from prime down to sub-sub. In another litigation the creditors of a defaulting sub-subcontractor sought recovery for sums owed from the prime contractor. The court of appeal held that a written agreement between the prime contractor on one project and a subcontractor — which provided that certain money was to be retained by the prime contractor for the purpose of paying the subcontractor — included obligation to pay past due bills of the sub-subcontractor.

On the other hand, the higher tribunal reversed the lower court's decision in a case involving a chattel mortgage foreclosure against an air conditioning subcontractor. Year 'round air conditioning, said the court, is "necessary for health and comfort of occupants;" consequently as there was in this case, "real and constructive annexation to the realty," the air conditioning system becomes "a fixture precluding foreclosure of chattel mortgage." ǂ

WILLIAM HURD HILLYER, *author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. He has an extensive practical legal and financial background.*

This series presents actual cases. Naturally, laws vary in different states. All names are fictitious.

MAIN SUPPLY DUCT was hung from hall ceiling on each floor, then furred in. Hall serves as return air plenum

18 Zone Cooling Modernizes a 9 Story Hotel

. . . for $293 per room

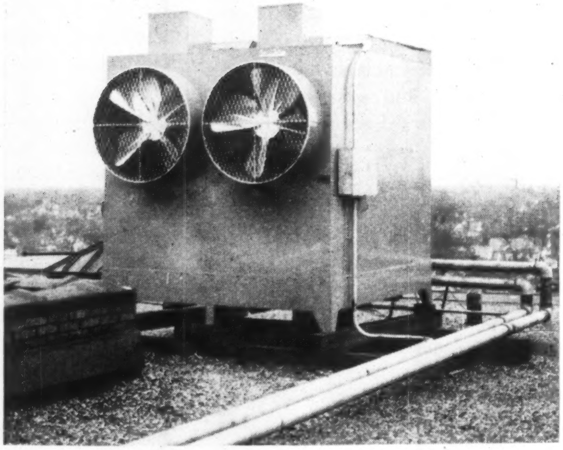
Dividing each floor into two zones supplied by 10 ton packaged units kept hotel open during work and provides correct amount of conditioned air for each room through graduated trunk system

Eighteen 10 ton package air conditioning units are installed in the nine story Leland hotel, Springfield, Ill. Two units serve two zones on each floor of the ell shaped structure.

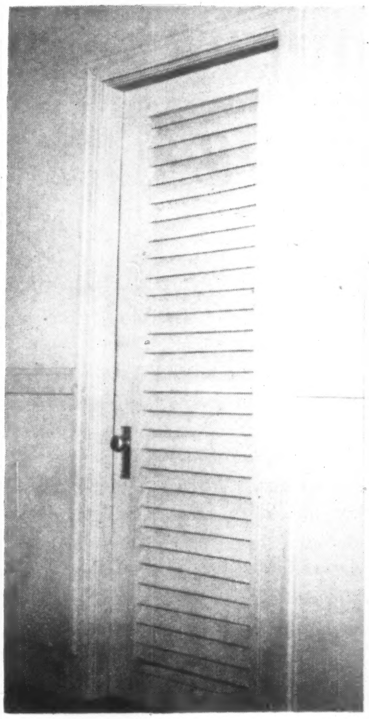
The use of two zones per floor made it possible to close off the area being worked on for the required time to cut wall openings for the supply air ducts and to install door exit grilles.

On each floor one unit is installed in the chamber maid's service room and the other is in a service corridor at one end of the wing.

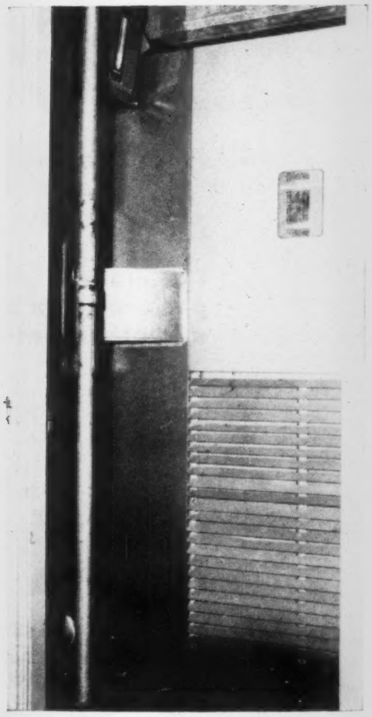
Conditioned air is discharged into a graduated trunk system, with takeoffs to each room. After the duct system



INDUCED DRAFT COOLING TOWER, one of two, is installed on ninth story roof. The other is on a three-story wing roof



LOUVERED DOORS permit air from conditioned rooms to enter halls, from which it returns to units for mixing with outside air



EQUIPMENT ROOM — two on each floor — contains 10 ton unit and panel board with switches, starters, and controls

was fastened to the ceiling of the hall, a drop ceiling was installed. Return air passes from conditioned rooms through door louvers into the hall, which serves as a return plenum from which the package unit draws its supply air to mix with outdoor air brought in to comply with the ventilation code.

The problem of obtaining a supply of outside air was solved by installing an air duct along one wall of the elevator corridor to the outside wall. The masonry wall was broken away and outside grilles with louvers and screens were installed. This duct and its plaster covering reduced the elevator corridor's width by only 12 in. and did not reduce its capacity to any noticeable degree.

Install Additional Power Supply

The increase in power demand required an additional power supply from the utility company's main cable which, after entering the hotel's power panel room, was distributed to each floor through its own cable. One cable was brought up the elevator shaft and fed under the floor into the machinery room where a panel board was installed for switches, starters, and controls. A second power cable was carried through the service shaft to the service corridor where the second unit for each floor is installed.

TABLE 1—COST ANALYSIS prepared for installation and operation of package air conditioning system, consisting of 18 10-ton units, in the Leland hotel, Springfield, Ill.

Total cost per room, including equipment, tower, ductwork, plumbing, and wiring	$292.67
Estimated added yearly revenue, $1.00 per room per day	$105.00
Estimated cost of operation per room per year, electricity and water*	$8.25
Net added revenue per room per year	$96.25
Approximate number of years to amortize investment	Three

*Cost of operations based on 7 cents per 100 cu ft of water; 1 cent per kw of electricity.

After calculating the water volume for a waste water system, it was decided that considerable saving could be made by using induced draft cooling towers. Two towers are installed on the roof, one on the ninth story roof and one on the roof of a three-story wing. Main line piping forms a closed circuit from which supply and return connections for each package unit are taken.

Make Installation Over a Three Year Period

The entire installation was spaced over a three year period, with about one-third of the hotel being completed each year. This permitted work to be done at times most convenient to the hotel operators.

The cost analysis of the project is shown in Table 1.

After one season's operation, the hotel manager wrote: ". . . It has been 100 percent satisfactory. Mechanically, it has been trouble free; and from a performance standpoint, it has very adequately air conditioned the rooms with cool, fresh, dehumidified, dust-free air. In fact, one can almost smell the freshness in the rooms and corridors..."

The system was designed and engineered by Automatic Heating Supply, Inc., and installed by L and L Heating and Air Conditioning, Inc. ╪

Want to Improve Your Technical Writing?

The method given here, proven by the author in his own experience, can help you write better technical articles, reports, and other material and do it more effectively and easily

BY KALMAN STEINER
Steiner Technical Writings

IN THIS ARTICLE I shall try to define briefly the various classes of technical writing and show something of the extent of each and to show one way to do reasonably effective technical writing.

Textbooks are not covered in this treatment of technical writing. Discussed are journal articles, reports, monographs, manuals, and handbooks. These writings take the expository form; they are explanations intended to enable a reader to do or to comprehend something that is technical.

We are are considering more than a newspaper article that describes a technical subject, yielding fair comprehension. Even though the article were to appear in the *New York Times* or *Chicago Tribune*, on the scientific page, a newspaper article would not guide an engineer or scientist thoroughly enough for these gentlemen to repeat the described task.

Technical writing assumes a more exacting level: communication that gives such clear information that a reader at the designated level — technician, engineer, or scientist — can grasp it and use it, and proceed from it to still more advanced technical work.

The journal article least fits exact definition. It shares with the report the characteristic of summarizing some investigation or special piece of work in research or development, or perhaps reviews the most conspicuous features of some project. Publication of an article implies freshness of topic.

To the reader, much of the value of an article lies in knowing who wrote it. Other forms of technical writing may have authorship submerged or concealed — except the report — but seldom is the journal article anonymous. By the same token, the journal article affords the author his best opportunity for bringing his name and work before the public, especially the readership of a technical or scientific journal.

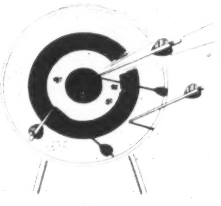
A monograph is a small treatise or textbook. It sets forth just about everything that is known on a given subject of limited range. Obviously, a piece of writing containing all that is known about American Indians would run into many volumes; but an essay on their principal weapon, the bow and arrow, would be a monograph if sufficiently comprehensive. To be so, it would need to cover: historical background, economic importance, political and military implications, physical science, archery as an art, and a forecast of future developments concerning the bow and arrow.

The manual differs from the monograph in that it is a practical guide only, and does not concern itself, usually, with historical background, political and economic significance, or any other aspect of a subject other than the strictly utilitarian. The manual answers the questions: what is it, how is it used, how is it kept in repair?

Finally, the handbook differs from a manual in that it might be deemed something between an elaborate manual and a foreshortened monograph. It contains more background material, perhaps, than a manual, and probes deeper into the ultimate significance, but only from a single or narrow point of view; not from the all embracing attitude of the monograph.

Having defined very briefly the chief forms of technical writing, let us proceed to see how "creative" technical writing can be done at a high level without too strenuous an effort and without extraordinary training or endowment.

This article is adapted from a speech given by the author before the engineering seminar, Chemical Corps Engineering Command, U. S. Army Chemical Center, Md., early this year. Mr. Steiner, an engineer and author of many articles published in HPAC and other technical writings, is a member of HPAC's board of consulting and contributing editors.



Write to a Specific Audience

A decision is needed as to the technical level of the contemplated piece of writing. For whom is it being written? If for students in a trade school or others who may or may not have finished high school, that is the first technical level.

If for young engineers who are about to enter industry and need a compact summary of the economics, physics, chemistry, and engineering for a specific application, that is a considerably higher technical level.

If for a session of one of the learned societies in science or engineering, comprising an audience that includes acknowledged authorities who already have full knowledge of basic concepts and seek information on recent developments and most advanced scientific theories, then we are at about the top level of technical writing.

On an intermediate level, not quite amenable to exact definition, is the article for the scientific or engineering journal having wide readership representing all three previously defined levels. At any rate, the author decides for which readership or audience he is writing, and sets his sights accordingly.

Arrange Facts into Related Groups

First of all, writing a technical paper is factual, not imaginative writing. Accuracy, carefulness, and thoroughness are virtues that are still values. But as the saying goes, easy writing makes hard reading; hard writing makes easy reading. Literary values still prevail in technical writing, curiously intermixed with facts. Deductions of Maxwell, Einstein, and Bertrand Russell are not only mathematically correct, but also beautifully written. Therefore, they win universal recognition.

We will assume that we have at our disposal adequate raw facts, that is an adequate knowledge of our subject. The basic thing is to assort these raw facts with which we are so brimful, into groups. Let us assume that we are to write a paper on fuel oil, after having studied the subject exhaustively.

Do we want to write an article, report, manual, monograph, handbook, or textbook? Obviously, the nature of the project is determined by its objective, as discussed previously. Our raw facts are now arranged by groups. Titles are given first to the major groups: economic importance, geographical distribution, chemical properties, physical properties, utilization as fuel, and so on. Are these groups logical? How about more of the same? Let us concentrate on just one of these, because, *presto*, a dozen would constitute a book.

In our array of facts we find that fuel oil has application in two broad areas: heating for comfort and industrial fuel. Comfort heating subdivides into homes and large structures. Industrial fuel oil divides into two principal parts: steam boilers and direct fired furnaces.

At this point we must exercise great self control, or we will find ourselves writing about heating systems, or steam power plants, or metallurgy. We must not detour, nor expand our writing to encompass in its entirety a related but actually different subject. Our subject remains fuel oil.

Now we have to consider storage, preheating, pumping, atomization, and control. Our thoughts about storage might logically be grouped thus:

I. Storage
  A. Aboveground tanks
  B. Underground tanks
  C. Inside tanks

Suppose we give the same treatment to the next topic or cluster of facts:

II. Preheating
  A. Heating media
  B. Types of construction
  C. Control of preheating

And so on:

III. Pumping
  Etc.
IV. Atomization
  Etc.

Of course, subtopics also break down into parts. For example, fuel oil may be preheated by transfer of heat from something else, called the heating medium. So we start tabulating the different media, carrying the identifying symbol along as before:

II. Preheating
  A. Heating media
    1. Steam
    2. Hot water
    3. Electricity

But steam exists in different conditions, important to the engineer. So we develop it further:

II. Preheating
  A. Heating media
    1. Steam
      a. High pressure
      b. Medium pressure
      c. Low pressure

Further subdivision and classification are used so long as any single entry requires statement and placing. When the last subtopic and sub-subtopic have thus been analyzed, the entire skeleton for our piece of technical writing is complete. It now requires only the sentences and paragraphs to give it flesh and blood and bring it to life.

The outline serves so many purposes as to be indispensable. How, without it, can the writer develop his theme logically, in a sequence that carries the reader along gently, without the sense of jolting from one idea to another? Like bricks in a wall, each element of an outline both receives support from and gives support to other elements. And just as a continuous brick wall would be monotonous unless relieved by windows, doors, cornices, and other ornamentation, so a continuous technical discussion requires some device to relieve monotony. The outline aids a reader wanting to make a quick reference for information on a special point.

Interpret Facts

From his outline the author proceeds to write his composition. A few examples will illustrate how the phrases in the outline become sentences in the final product. Suppose we have reached the point in the actual composition of the entry II. A. 2 — Preheating fuel oil using hot water as heating medium. The text might run:

"Where heavy fuel oil is being burned in a hot water heating system, the average temperature of the hot water can be assumed at 180 F, the average temperature of the oil in transit through the heater at 130 F, so that the average temperature difference will be 50 F. The design of heating surface for the oil heater, then, shall be based upon this average temperature differential of 50 F. This is the potential difference that causes heat to flow from the heating medium into the fuel oil."

The success of any compostion rests upon the author's presentation of his facts. But nothing can be taken for granted. Professor Robert S. Lynd of Columbia university says in *Knowledge for What?*, "One cannot assume that the meanings of facts are always clear or unequivocal. We assume the author understands his facts and can state them so clearly that his meaning is understood." In technical writing it certainly must not be assumed that the facts speak for themselves. Usually, the facts need interpreting.

In interpreting the facts, the author reveals his thinking and expresses himself. The way he expresses himself is his style. For technical writing the objective of literary style is to attain readability yielding comprehension. But complete uniformity in literary style would be as undesirable as it is difficult of attainment. Uniformity implies monotony, and monotony does not make for readability. There are recognized techniques for avoiding monotony, for sustaining reader interest, and for attaining good readability.

Title, Introduction Should Describe Content

Besides a frame, or an outline, every piece of technical writing requires a foundation, or an introduction, its dimensions depend upon the load it is to carry. For a brief report, a single paragraph may serve as introduction. In some textbooks the introduction occupies the entire first chapter. An architect would not waste concrete by pouring a foundation of greater dimensions than required to carry the superstructure. So a writer would not extend his introduction beyond that prudently needed to support what follows.

Since the objective of technical writing is to explain something to somebody, we might as well start right off with the title. Let it convey as nearly as possible an exact description of the nature and scope of the composition. Recently I came across a technical paper entitled "Systems Engineering." I wondered whether the author was talking about railroad systems, filing systems, or accounting systems! It took the reading of a couple of paragraphs to realize he was writing about systems of electronic computers.

The title and the introduction, then, get us started on our way. How fast we proceed — if you'll pardon my switch from a brick wall to a conveyance — depends entirely upon the ground we have to cover and the allotted time (or length). But regardless of the speed, we try to make the journey smooth and in one direction. We don't want to take our reader up a blind alley, discover we cannot go onward, and then have to backtrack and pick up another trail. Or at least, if several avenues must be explored, we must escort the reader, not dump him somewhere while we shift into reverse to get back to the main highway.

Use Various Devices to Make It Interesting

Now let us consider knacks for making the journey interesting, so the reader will not become bored, feel sorry for himself, and wish he had gone to a movie instead. Or having become a heating, piping, and air conditioning engineer or contractor, wish he had become a professional athlete instead.

Analysis of a large number of technical and semitechnical writings reveals the following devices used to sustain reader interest: definition, description, contrast and comparison, specific instance, quotation, humor, rhetorical question, analogy, startling statement, citation of authority, repetition for emphasis, vital facts, and artistic methods of graphic presentation, including charts and graphs, statistics and tabulations, and photographs and drawings.

Also to develop the theme of the technical article, there are several standardized procedures to choose from. These may with a bit of skill be combined at will. Although I state them baldly, we must always be alert to avoid being boring:

- Chronological, in which we relate facts in their time sequence of occurrence.
- Cause and effect, as when sulfuric acid is added to (a) sodium hydroxide, (b) sucrose, and so on.
- Mathematical development, as Maxwell did in establishing the electromagnetic nature of light.
- Relationship of each part to the whole.
- Climatic, starting from the obvious and proceeding to the bomb burst or to an absurdity.
- Statement of probabilities under certain sets of circumstances.

It is evident that with some thought we can hit on an interesting way of stating what it is we have to say.

Apply Simple Tests to First Draft

After writing the first draft, it helps to apply a few tests: Have we maintained singleness of purpose? Have we fulfilled our obligation as to exactness of data, clarity and conciseness of expression, coherence of arrangement, tactful presentation? Have we exercised judgment in what we said and how we said it?

In addition to the selection, arrangement, and presentation of facts, there are a few matters of mechanics to consider. It never does any harm to review some of the things we were taught in our English classes.

We avoid very long sentences, but we do not use a succession of short ones. We mix them up, without making the short ones very short or the long ones very long.

In the bulk of the text, we stick to the conventional sentence arrangement of subject, predicate, and object. But the occasional use of inverted arrangement, if used without obscuring meaning, relieves monotony and gains emphasis.

For the most part, in technical manuals, instructions are issued in imperative sentences: "Use the jack to raise the axle until the wheel is clear of the ground, then remove the nuts from the hub lugs, using the special wrench provided for that purpose."

The verb form called the active voice, being allied to the imperative, has more vitality than the passive. For instance, "The oak tree makes sturdy timber," instead of "Wood from the oak tree may be utilized to produce sturdy timber."

Good writers of English prefer short, and where possible, Anglo-Saxon words, rather than longer derivations from other languages: "type" or "class" rather than "category," and "harmful" rather than "deleterious."

For ornamentation, the simile and metaphor can be and are used extensively in nontechnical writing, but should be used only sparingly in technical writing. Like all ornamentation, figures of speech require deft use; excessive ornamentation can betray poor taste and bad judgment.

At the risk of exile from my native land, I cite an example of what I consider overworked metaphor, from an official government publication:

"Today we pause momentarily at an indefinite but nevertheless real frontier somewhere above 1000 megacycles. Naturally, we are not the first to arrive on the scene. Those hardy pioneers, the physicists, have been here for years. The Cabots, the LaSalles, and the DeSotos passed by more than half a century ago. Even the Lewis and Clarks, the Daniel Boones, and the Kit Carsons have long since come and gone. Perhaps it would be fair to say that the engineer is here as a kind of homesteader. His is the very important task of breaking the primeval sod to sow the seeds that he hopes will place the countryside on a productive basis."

But it is easy to criticise. I shudder to think what criticism this article of mine will evoke if some eager reader takes the time and trouble to analyze what I have ventured to say.

To summarize: Decide on the type, scope, and length of the proposed writing, and for whom intended. Array your facts, group them for logical development, preface them with a suitable title and introduction, then tell the story in its simplest terms for the given reader level. Use a straightforward style but avoid monotony. In closing, give a concise summary of what you have written. ‡

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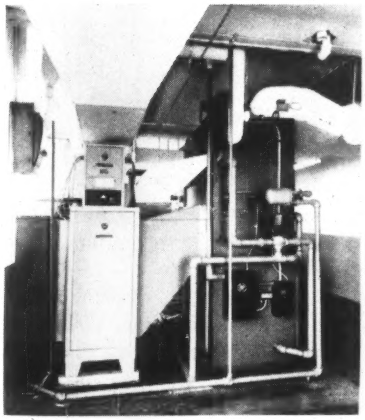
20 Ton Unit Conditions Instrument Plant

. . . installation modified to meet special needs



IN A PLANT where gages and precision instruments are manufactured, 1/10,000th of an inch can mean the difference between a usable part and one that goes on the junk pile.

Stability of temperature and humidity is all important. To assure this stability, air conditioning is a necessity.

For example, many of the gages and precision instruments made by the Victoreen Instrument Co. of Cleveland, Ohio, are for the armed forces and must pass rigid inspection. To guarantee maintenance of close tolerances, finer precision, and greater accuracy, Victoreen recently installed a 20 ton package air conditioner, according to the Typhoon Air Conditioning Co., a division of Hupp Corp.

The temperatures usually employed in the precision instrument field — between 75 and 80 F ±½ F — called for special measures. The relative humidity conditions generally maintained are between 45 and 50 percent with ±1½ percent tolerance. For less critical instruments, it is common to maintain limits of ±1 F and ±5 percent relative humidity.

To meet the special needs of the Victoreen assembly room, a three row condenser water reheat coil, a one row low pressure steam coil, and a fixed bypass — 1830 cfm — around the cooling coil are installed. In addition, an electrostatic air filter is installed ahead of the air conditioner. ‡

1 DIGITAL COMPUTER shown here — IBM 650 — consists of three units, left to right: read-punch unit, console unit, and power unit

How to Use Digital Computers To Calculate Piping Flexibility

Here's a brief review of three years of experience by the authors' firm in the use of digital computers for flexibility calculations of main steam and reheat steam piping systems in central station applications.

BY TOR KOLFLAT and K. E. KNAPP
Sargent & Lundy, Engineers

CENTRAL STATION DESIGN may be defined as the integration of separately manufactured components of equipment — such as steam generator, turbine, pumps, fans, heat exchangers, and auxiliary electrical equipment — into a complete and efficient thermal plant. A major portion of this integration is accomplished by piping.

Piping in central stations includes the handling of such varied fluids as water, steam, air, oils, acid, hydrogen, and carbon dioxide, with capacities ranging anywhere from less than 1 gpm up to 130,000 gpm. Operating conditions may range in pressure from 14 psig below atmospheric to 4000 psig above atmospheric, with some temperatures as high as 1200 F. All schedules of pipe having outside diameters anywhere from 1/8 in. to 120 in. are employed.

With the above variations in type of fluids, capacities, operating conditions, and physical sizes, it is evident that a large number of design problems occur in the development and engineering of a central station piping system. One of these problems is the calculation of piping flexibility.

Four Major Factors Affect Flexibility

The four major physical factors that influence flexibility are:

- Thermal expansion.
- Modulus of elasticity.
- Moment of inertia.
- Configuration of system.

1. *Thermal expansion.* Thermal expansion is a function of temperature and material. For carbon steel, carbon-moly steel, and low chrome steels — less than 3 percent — the thermal expansion is the same and runs about 0.9 in. per 100 ft per 100 F.

Austenitic stainless steels have a slightly higher coefficient of thermal expansion than the chrome-moly steels, but in both cases the coefficient increases approxi-

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This article is adapted from a paper presented at the recent American Power Conference in Chicago.

mately linearly with temperature, as shown in Fig. 2. Therefore, we see that moments and forces in a piping system are proportional to the operating superheat and reheat steam temperatures of the boiler.

2. *Modulus of elasticity.* Modulus of elasticity — Young's modulus — is an experimentally determined ratio of stress to strain, within the elastic range, and is a function of temperature and material. A plot of the modulus of elasticity for some typical piping metals versus temperature is shown in Fig. 3. These curves reflect the following:

a) Moduli decrease with increase in temperature.

b) Alloy steels decrease less rapidly with increase in temperature, than carbon steel.

c) At room temperature carbon steel has the highest modulus, ferritic type alloy steel next highest, and austenitic stainless the lowest.

Calculations of the expansion stress in a piping system are based on the maximum modulus of elasticity which, as seen in Fig. 3, is the modulus at room temperature.

The reactions — forces and moments — are directly proportional to the modulus of elasticity. An increase in the modulus causes an increase in the forces and moments of a piping system.

3. *Moment of inertia.* Another factor that has a direct relationship on the moments and forces in a piping system is the moment of inertia. As the moment of inertia increases, the pipe becomes more rigid, and the magnitude of moments and forces increase. The moment of inertia is a function of the inside and outside diameters and is defined by the equation:

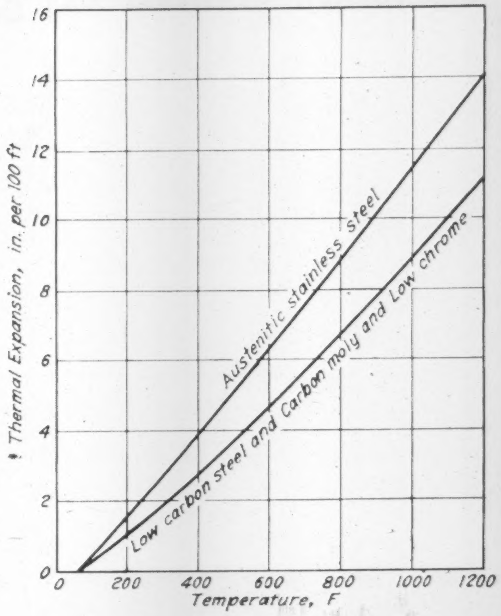
$$I = .05(D^4 - D_1^4) \qquad [1]$$

where: D = outside diameter of pipe; and D_1 = inside diameter of pipe.

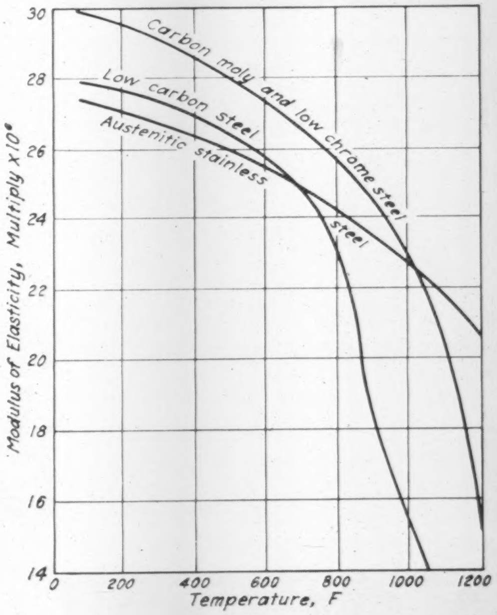
It is noted that the moment of inertia increases much more rapidly than its corresponding diameters due to the fourth power relationship.

Almost without exception the final installed costs of a single full size pipe line is less than two half size pipe lines. With single superheat and reheat steam pipe lines, the diameter has a direct relationship to the capacity and operating pressures of the steam generator. Since the rigidity increases with the moment of inertia, and the moment of inertia increases with the pipe diameter, which in turn is proportional to the steam generator capacity and operating pressure, we may conclude that the forces and moments of a piping system are a direct function of steam generator capacity and pressure.

4. *Configuration of system.* Rigidity of a piping system is directly proportional to the aforementioned thermal expansion, modules of elasticity, and moment of inertia (i.e. a 20 percent increase in either one of the three will cause a corresponding 20 percent increase in the forces and moments). No such simple generalization can be made regarding the configuration of a three dimensional piping system, since its relationship to rigidity is more complex.

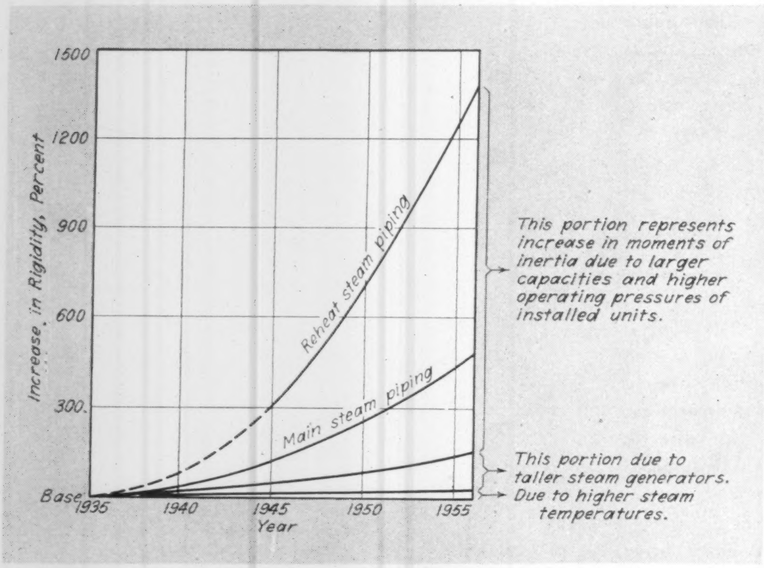


2 THERMAL EXPANSION is a function of temperature and material. Low carbon steel contains 0.3 percent or less, and carbon moly and low chrome contain through 3 percent alloy



3 MODULUS OF ELASTICITY is plotted here for some typical piping metals at varying temperatures. Alloy steels decrease slower with increase in temperature, than carbon steel

. . . flexibility problem has become greater the last 20 years



4 INCREASED RIGIDITY in central station steam piping from 1935 to 1956, due to several changes in design features, has amplified the problem of flexibility

Two or more piping systems having identically similar layouts will possess the same flexibility characteristics, but the probability of actual systems being identical is extremely remote. Caution must be used in any attempted generalization or utilization of flexibilty slide rules or tables since even slight variations in configuration might greatly influence the flexibility. Some of these variations are:

a) Length relationship of vertical and horizontal pipe runs between steam generator and turbine.

b) Number of pipe connections to steam generator and turbine.

c) Location and number of pipe elbows, bends, and fittings.

Fundamentally, the forces are inversely proportional to the length of the member to the cubed power. However, with the decreasing ratio of building volume to kilowatt capacity in central stations, it is becoming more and more difficult to obtain the necessary flexibility by increasing the length of members in a piping system.

The height of a steam generating unit will influence the rigidity since the length relationship of the vertical and horizontal pipe runs becomes larger with an increase in steam generator height.

Recent Trends Amplify Flexibility Problem

As described above, the following central station design features influence the flexibility of a piping system.

1) Steam generator capacity and operating pressure — (moment of inertia).

2) Height of steam generator — (configuration).

3) Steam temperatures — (thermal expansion).

Changes in these central station design features, during the last 20 years, have increased the rigidity of main steam and reheat steam piping and has amplified the problem of flexibility, as shown in Fig. 4.

These curves are based on the following installed unit sizes and operating conditions:

Year	Kw	Psig	F
1935	60,000	850	900
1940	75,000	1250	950
1945	80,000	1450	1000 — 1000
1950	150,000	1800	1000 — 1000
1955	200,000	2000	1050 — 1050

Moments of inertia encountered today have increased from 700 in.^4 in 1935 to 3500 in.^4 — 450 percent — for main steam lines and up to 13,000 in.^4, — 1350 percent — for reheat steam lines, as shown in Fig. 4. The major cause of this increase has been the larger size units and higher operating pressures necessitating pipes with higher moments of inertia. Reheat steam piping is a more critical problem than main steam piping because of its relatively larger moments of inertia. ≠

In the next article the author will discuss what flexibility calculations determine and will outline computer solution procedure using an adaptation of the general analytical method.

How Thermal Factors Affect Comfort

. . . and maintain heat losses of building occupants equal to their heat liberation. Here is a brief discussion of how air temperature, humidity, air motion, and radiation are affected by the construction and how each may be controlled.

BY E. R. KAISER
Senior Engineering Scientist
Research Div.
New York University

THERMAL FACTORS that affect comfort indoors include four of primary importance: air temperature, air humidity, air motion, and radiation. How is each affected by building construction? How may each be controlled?

Bodily functions produce from 250 Btu per hr at rest to 1200 Btu per hr at hard physical labor. If the body temperature is to be maintained constant, these quantities of heat must be lost promptly to the surroundings.

- When the room air is 75 F, ± 2 F, most people at rest or light work will lose excess heat and be comfortable when lightly clothed. Were it not for clothing, the same people would desire an air temperature of 81 to 86 F.

At higher rates of work and bodily heat output, the ambient temperatures should be reduced below 75 F for lightly clothed persons.

Insulation in the outer walls, roofs, and sometimes floors helps to maintain the inside surface temperatures close to the indoor air temperature, and thus to minimize the flow of cold air down the outer walls and across the floors in winter.

- Dryness or humidity of the air has physiological effects which influence comfort. Most people are comfortable when the relative humidity is between 30 and 70 percent. The optimum for comfort is probably near 50 percent when the air is at 75 F.

As people lose about 0.1 lb of moisture per hr by perspiration while at rest, and larger amounts while engaged in physical exertions,amminess of the skin must be prevented by evaporation to air dry enough to pick up the moisture readily, but not too fast so that the skin, nostrils, and lips are left dry.

- Under ordinary conditions, the air in a room or building is in motion because of natural differences in temperature, infiltration, and ventilation, and the heating and cooling systems. Air velocities around persons at rest or light activity should exceed about 15 fpm, but with few exceptions should not exceed 50 fpm.

Downward currents of cool air that occur at outside walls and windows spill across the floor and may flow across ankles at some distance from the wall, unless countercurrents are established by the heating system.

Remedies include more insulation in the walls and double glazing; baseboard heating, or perimeter heating, with vertical projection of warm air at the windows; radiation from ceiling panels; and electric panels on cold walls, if necessary.

Air velocities in the living space are influenced by the location of air diffusers. It is important that the air velocities be reduced to under 50 fpm shortly after the air enters.

Where people are working at high rates, or when the air temperature and humidity are above that for 75 F and 50 percent relative humidity, higher air velocities are desirable, but such velocities should be controllable.

- The temperatures of room surfaces have a direct effect on human comfort independent of air temperature and air motion. A portion of the heat loss of the occupants is by radiation to the room surfaces. The colder surfaces of the outer walls, particularly the windows, have a very noticeable effect in the winter. Conversely, surfaces at above 86 F radiate heat back to the skin, offsetting in degree the loss to the cooler surfaces of the room. In rooms with radiant heating surfaces, the surface of the body and clothing receives heat and must lose more heat to cooler surfaces to maintain the thermal balance characteristic of comfort. Baseboard heating offsets by radiation the effect of the colder outside walls.

Electric lighting is another source of radiant heat that may cause discomfort. As light intensities increase in commercial buildings, more attention must be given to removing the excess heat by air conditioning, cooled ceiling panels, and the increased use of fluorescent lighting. Motorized business machines also liberate heat.

Much heat enters rooms by radiation through unshaded windows on sunny days, adding significantly to the air conditioning load. Awnings and many newer types of window shading devices effectively reduce the heat gain. Indoor venetian blinds, draw shades, and drapes have a lesser, yet important, effect. Some installations have also been made of shading louvers between double glazing. Heat absorbent glass also intercepts much solar radiation.

Due to the effect of radiation on the room thermostat, the thermostat should be installed where fluctuations in radiation are minor.

Thus, thermal comfort is the result of balancing the environmental factors to maintain the heat losses of the occupants equal to their heat liberation. The feeling of comfort is the final criterion of whether the balance has been achieved. ǂ

The author was formerly director of research, American Society of Heating and Air-Conditioning Engineers.

"LIKE CLOCKWORK" describes the maintenance procedures required to keep in operation the heating and air conditioning systems serving this administration building

How Boeing Operates and Maintains Plant Heating and Air Conditioning

Here's how Boeing schedules maintenance for the heating and air conditioning systems in its Wichita plant. Operation of the systems — 16 hours a day — was discussed in the July HPAC.

BECAUSE of the critical nature of this air conditioning equipment and the necessity for efficient operation of the system at all times, routine patrols are maintained on the equipment. This helps in averting any breakdowns and possible subsequent damage to equipment not under surveillance at regular intervals.

The routine nature of the major duties of the air conditioning unit lends itself readily to organization. In the interest of promoting maximum familiarity of the operator with his equipment and in order to make possible the delegation of responsibility and authority, each man on each shift is assigned specific machines, by number, in specific areas for the purpose of routine checking and housekeeping. These routine assignments are made in writing on a performance chart and posted on the bulletin board in the air conditioning office.

This chart provides spaces where performance of routine operations may be checked off as they are done.

Any temporary assignment is also made in writing and posted, and the performance of any such assignment is checked on this chart as performed.

During the performance of major overhaul of equipment or in the event of a breakdown of equipment, the man to whom the machine is assigned, together with any needed help, is relieved of housekeeping duties and his second daily routine checking tour until the repair has been completed.

Any such overhauls or repairs are done during the first shift whenever possible.

Men on the first shift not engaged in the overhaul are, regardless of the shift on which the breakdown occurs, assigned, by number, the units thus vacated and perform temporarily the housekeeping and filter change duties as needed.

All air conditioning equipment in the entire plant is inspected four times during the first shift, four times on the second shift, and three times on the third shift.

Routine Items Are Checked by Patrol

During these routine inspections the following items are checked for proper operation and any adjustments needed are made to malfunctioning equipment.

a) Discharge pressure.

b) Suction pressure.

c) Oil pressure and level.

d) Condensing water temperature and pressure.

e) Entering air temperature.

f) Leaving air temperature.

g) Temperature in conditioned area or fixture.

h) Condition of air filters.

i) Liquid line sight glass.

j) Automatic water shutoff valves for leakage during off cycle.

k) Steam pressure at pressure reducing valve feeding unit.

l) Steam valves for leakage.

m) Thermostats and controllers for malfunctioning or damage.

n) Housekeeping.

o) Fixtures and housing for broken or damaged parts or damage and misuse tending to handicap the equipment unnecessarily.

p) Pump packings.

q) Bearing on pumps, fans, motor, and so forth.

r) Evaporator for damage or obstruction.

s) Air cooled condensers for damage or obstruction.

t) Belts, pulleys, belt guards, and so forth.

u) Fan on forced draft towers or evaporative condensers.

v) Control system for all overhead heaters and heating systems.

w) And all other visual checks tending to indicate the condition of the equipment or the existence of handicaps to the proper and economical operation of the equipment.

Any malfunctions requiring minor adjustment will be corrected at the time of the patrol.

How Corrective Work Is Scheduled

If the trouble requires shutting down the equipment or if additional help is needed to correct the situation, the shift foreman is notified, and assignments are made for the corrective work.

If there is possibility of immediate damage to the equipment, it is shut down immediately, the person in charge of the shift is notified, and corrective action is taken.

All air filters are changed by persons designated by the unit foreman at times indicated by the foreman. Filters found on daily inspection to be in bad condition due to unusual conditions will be changed by the person or persons charged with changing filters on that unit.

List Services Above Routine on Weekly Sheet

Scheduled services and inspection are those which are considered in and above all routine services. (Routine services are considered up to and including weekly services.) The following services are essential and are performed without exception. They are placed on the master schedule, and the proper persons are notified through the weekly work schedule of maintenance services.

a) Except for special cases, all filters are changed at least once each month on a specified day.

b) Throwaway type filters are used one month, dusted out, and used two more weeks before being replaced. This type of filter is used only on equipment originally equipped with this type.

c) Viscous oil tanks on automatic filters are cleaned annually at a time specified by the foreman in charge of the unit. The oil is replaced at the direction of the foreman, also.

Dirty metal filters are delivered to the filter cleaning machine in the salvage area by air conditioning personnel changing the filters. Once the filters have been cleaned, they are delivered to designated storage cabinets by salvage personnel.

d) Water cooler equipment provided with removable condenser heads is inspected at least once each year. This inspection, immediately prior to the operating season for the equipment, includes the removal of the heads and inspecting and cleaning the condenser as required.

e) Equipment which operates eight or more months per year is inspected and cleaned at least once every six months.

f) Cooling towers and evaporative condensers are cleaned every two weeks during the operating season. This cleaning is accomplished by personnel assigned to the first shift and is done on a non-workday when the least possible number of persons will be in the conditioned areas.

g) All water towers are equipped with proportional feeders which are serviced and filled to the proper level every fourth week. The person cleaning the towers services these feeders.

h) Cooling tower treatment for algae control varies from time to time, and periodic chemical cleaning is performed as dictated by the existing conditions.

i) On Saturday of each week, water samples from each cooling tower and evaporative condenser are obtained and analyzed by first shift personnel to determine the pH factor of the water.

j) Once each month on the Saturday preceding the first day of the month, water samples are taken from each tower or evaporative condenser. They are properly identified and sent to the company supplying the water treatment. There a detailed analysis is made, and any recommendations made by the supplier of the treatment is followed without exception.

k) The men assigned to the operation of the air conditioning systems perform all major overhaul and minor repairs to any system. These men also do any minor repairs needed on cabinets, fixtures, housings, fans, and so on. Major repair or overhaul of these components, not in any case to include condensing units, expansion valves, evaporators, is handled by appropriate maintenance skills.

l) Each shift makes a written report covering the activities during its time on duty. This report includes a listing of all service calls received and corrective action taken, all work done on any equipment and corrective action taken as the result of routine patrols, and any major adjustment to any control system. This report is intended as a source of guidance for the succeeding shift and also provides a record to indicate the need for major corrective work.

m) All air cooled condensers are cleaned at least once every month.

Lubricate After Scheduled Service

The lubrication of these air conditioning units is accomplished by the lubrication unit of the maintenance department. This unit is primarily responsible for the lubrication of the motors — except sealed units — and fan bearings. These are greased or oiled at the intervals specified on the lubrication schedule and are considered as a routine service.

A current copy of the lubrication schedule is maintained in the equipment maintenance records in each unit's folder. This schedule is determined by the manufacturer's recommendations and peculiarities of the installations, which are investigated by the lubrication unit, the lubrication engineer, and the inspection section.

After each major scheduled service the unit is completely relubricated. At the present time the lubrication schedule is not entered on the master schedule except when a lubrication system is involved.

Cleanliness, Neat Appearance Essential

Air conditioning maintenance personnel are responsible for the appearance of all equipment under their jurisdiction.

a) All equipment is wiped and dusted at least once each week.

b) Floors in enclosed machine rooms and immediately adjacent to all nonenclosed machines are swept at least once each week and more often if needed.

c) Minor touchup of paint and repainting of newly overhauled equipment is also done by the personnel assigned to the unit.

Coordinate Maintenance Operations

As stated previously, the foreman in charge of the system makes all assignments for special repairs. Any new installations, major overhauls, and rearrangements are controlled and assigned by the scheduler in the work control unit of the maintenance department.

It is the responsibility of the air conditioning, heating, and construction representative in the material control unit to arrange for the procurement of all stock required in the maintenance of these systems. Supplies are drawn from the stock cribs by requisitions for raw material stores.

The utmost caution and safety measures are used when working with these systems. The workmen are all informed that the type of work involved in the operations of the system can be most dangerous, and that they may be exposed to situations which could be disastrous to themselves as well as to plant facilities. Therefore, they are required to know and use the safety rules and regulations stipulated when working with these systems. ‡

Here Are Basic Principles of Air Curtain Design

. . . interest still growing in methods, applications

INTEREST continues to grow in the design and installation of air curtains for heating or air conditioning open entrances to stores and buildings. HPAC is still getting reader response to the article *Air Curtain Seals a Door Opening*, by Edward E. Gygax, in the January 1956 HPAC.

The so-called "doorless door," which had its beginning in Switzerland only a few years ago, soon came to the U. S., and several installations have already been made in this country. During the same period further applications were made in Europe, where there is still much interest in the principle, as evidenced by an article in the March issue of *The Heating & Ventilating Engineer & Journal of Air Conditioning*, abridged and translated from *Industries Thermiques*, November 1956. The article offers several conclusions:

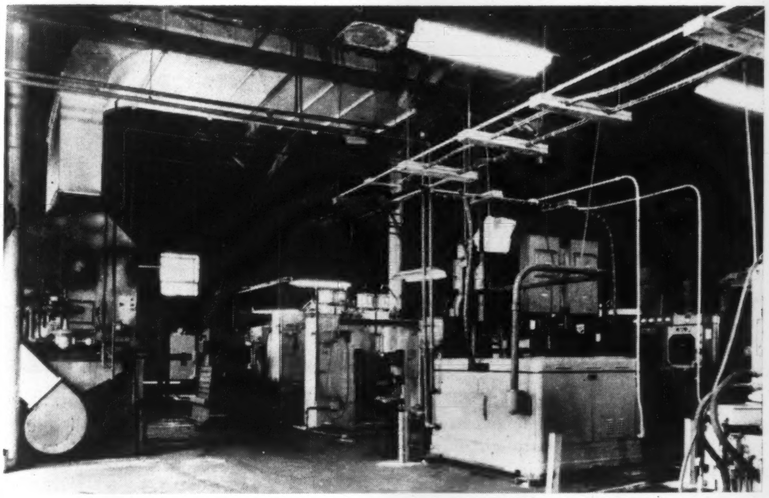
- It is as well to aim at the lowest possible velocity in the vicinity of the head, and not exceed 1200 to 1600 fpm. In practice, even this limit is difficult to keep to if a curtain is to remain stable under wind pressure, which might require up to 4000 fpm discharge velocity, leading to values of about 2000 fpm at head level. This defect should be avoided as much as possible by reducing the flow rate in calm weather.
- Air temperature at head level can be selected as a function of air velocity in that region from the expression:

$$t = 85 \text{ to } 90\ (v + 240/v + 390)$$

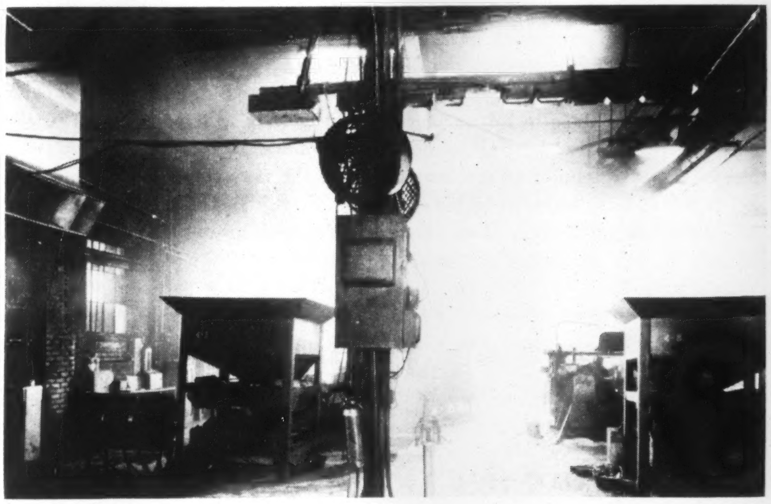
where: t = temperature, F; v = velocity, fpm.

- The discharge opening should preferably be a long slot with the duct having the same cross section throughout (tapering ducts should be avoided). The cross-sectional area of the duct should not be less than 2.5 times that of the slot.
- Wind forces greater than 800 fpm (0.04 in. WG) are difficult to counteract. For the same wind speed and discharge velocity, the volume, and consequently the width of the slot, will increase with the square of the height. Thus it is an advantage not to have too high an opening.
- The return grille should be about three to four times the width of the discharge slot. A gravity trap should be provided below it with entry to the recirculating fan via an efficient filter. Air washers are sometimes used.
- Discharge air volumes vary from 1500 to 15,000 cfm per linear ft of opening, the lowest value corresponding to sheltered sites and mild climates.
- Corresponding discharge temperatures range from 160 to 140 F for shops, and from 140 to 130 F for factories. The volume output of the system can be controlled automatically by a suitable damped manometer.
- Warm air curtains can also be used to separate two environments having different air conditions. Volumes and temperatures could then, of course, be considerably reduced.
- Considering the uncertainties that attend the design, it is prudent to allow a good margin in volume and heat input for subsequent adjustment on site. It is an advantage to have some means of varying the width of the discharge slot. ‡

ON THE JOB



Install Direct Fired Heaters



To Correct Negative Pressure

. . . and to provide zoned temperature control

Multiple gas fired forced air heaters, some with ducts but most without, are mounted vertically on floors and walls and horizontally on crossbeams to heat two plants, of 235,000 sq ft and 115,000 sq ft respectively.

MULTIPLE unit installations of direct fired space heaters were recently made in two medium size manufacturing plants, according to the Dravo Corp. In each plant process steam is supplied by one small packaged steam generator.

The installation of 29 gas fired, forced air heaters in the plant of Pressed Metals of America, Inc., Port Huron, Mich., as shown in the photos, has resulted in improved atmospheric conditions, correction of a negative air pressure, and uniform space heating. This company makes automobile parts.

The negative pressure was traced to the "hot upsetting" room where oil coated steel bars are brought to high temperature. This process results in large volumes of smoke and oil fumes which must be exhausted immediately. During the "hot upsetting" operation, one or more of 13 exhaust fans, each 36 in. in diameter and with a capacity of 20,000 cfm, had to be started. Exhausting this high volume of smoke and air without some means for makeup air created a strong negative pressure in adjacent departments.

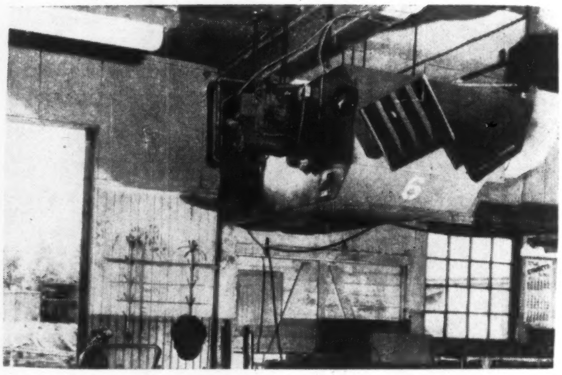
The plant, with some 235,000 sq ft of floor space has 24.7 million Btu per hr heat loss.

Eighteen large capacity warm air heaters and 11 smaller unit heaters are installed. Five of the heaters, with an output capacity of 1.75 million Btu per hr each, handle a total of 114,000 cfm. These heaters, equipped with dampers to introduce any desired portion of outside air, are located so as to eliminate drafts caused by the exhausted air.

Elsewhere in the plant six heater units of 1.25 million Btu per hr rating and one of 1 million Btu per hr output are installed. Smaller unit heaters are suspended on walls or from the ceilings in areas where wide distribution of heat is not required. Seven 180,000 Btu per hr units are in storage rooms, freight docks, garage, kitchen, and other areas, while three units each having a 68,000 Btu per hr output are in a storeroom and lavatories.

One unit with 750,000 Btu per hr output, designed to bring in approximately 2500 cfm of outside air to blend with recirculated heated air, is installed in the plant cafeteria. This

FORCED AIR SPACE HEATER — one of five of 1.5 million Btu per hr capacity — maintains 70 F temperature in high bay area of Detroit Harvester Co. plant, Zanesville, Ohio



SUSPENDED HORIZONTALLY, because floor space is at premium in Detroit Harvester's rake room, heater distributes warm air through nozzles set at 30 deg angle

unit helps other fans remove cooking odors and cigarette smoke, which previously accumulated in the cafeteria.

A 500,000 Btu per hr heater, discharging into existing ductwork for distribution of tempered air throughout partitioned areas, is installed in the general offices, and a similar unit of 400,000 Btu per hr output is in the personnel and first aid building. Both of these units operate integrally with cooling coils for air conditioning during warm weather.

All of the heaters that introduce outdoor make-up air are equipped with a dual damper arrangement. One damper controls the flow into the heater through an outside wall opening and the other is installed on the air intake facing the plant interior. Thus, the two dampers can be regulated to balance the mixture of outdoor air and recirculated air according to the requirements.

Modulating type controls are used for the burners in the heaters. This permits continuous operation of the heaters while the discharge air temperature is increased or decreased according to the demand.

•

The Zanesville, Ohio, plant of the Detroit Harvester Co.—shown in the photos above—recently installed eight floor mounted unit heaters, three wall mounted, and one horizontally mounted on crossbeams. Previously it had installed two heaters, each with a 1 million Btu per hr output in a warehouse.

The plant manufacturers farm implement and road equipment parts. It consists of existing expanded buildings and new structures. The plant has some 115,000 sq ft of factory space where uniform heating is desirable. The main building measures 540 ft by 160 ft, with the gable of the center bay 20 ft high. Two side bays are 14 ft high. Two other buildings measure 85 ft by 30 ft and 200 ft by 85 ft, with 20 ft gable roofs. All structures are of masonry brick construction, with large expanses of steel casement windows. All have numerous access doors for constant movement of electric trucks.

Five heaters, each producing 1.5 million Btu per hr and handling 17,000 cfm, are installed in the high bay area of the main production building. The heaters are floor mounted and have standard return air intake grilles and supply outlet nozzles. Cold air is drawn into the heaters at the floor level and discharged at high velocity parallel to the floor but above the heads of the workers.

High velocity discharge of the heated air results in even distribution in all directions from the heaters. As the return air is drawn into intakes on three sides of the heaters at low velocity, warm air is kept in the work area rather than rising to the roof. A separate thermostat controls each heater, and temperatures in the entire shop area remain at the desired temperature in each area throughout the winter.

Three wall mounted unit heaters, each with an output rating of 110,000 Btu per hr and each equipped with its own thermostat, provide heat in shop rest rooms and a receiving room enclosure.

In the rake room, measuring 50 ft by 30 ft, floor space is limited. A heater with an output of 250,000 Btu per hr at 2700 cfm is installed on crossbeams in a horizontal position. Discharge nozzles were fixed at a 30 deg angle to direct the air flow into the work area.

Another 500,000 Btu heater is floor mounted in the tin building to maintain uniform heating over the 17,000 sq ft of working space. In the service building factory, measuring 7000 sq ft, a heater with 400,000 Btu per hr output and another with 200,000 Btu per hr output are floor mounted.

In the general office area of the plant, a 200,000 Btu per hr heater is installed. Ductwork extends in two directions to distribute the warm air into private enclosures.

The entire installation is supplied by an 8 in. gas pipe line, with 2 in. feeder lines to each heater.

Fans in the larger size heaters are driven by 220 v, three phase, 60 cycle motors, while the smaller heaters and wall suspended heaters are powered by 110 v, single phase, 60 cycle motors. ‡

How to Join PVC Pipe, Fittings

POLYVINYL CHLORIDE PIPE — normal and high impact — may be joined by solvent cemented or threaded joints, according to the National Tube Div., U.S. Steel Corp. If accepted joining procedures are followed, a tight, leakproof, and permanent joint may be obtained with either type of joint.

Schedules 80 and 120 PVC pipe can be threaded by using standard metal thread cutting tools, either hand or machine operated. Threading of Schedule 40 is not recommended. For a temporary installation or one susceptible to constant modification, threaded or flanged joints are recommended. Assembling pipe and fittings should be done with strap wrenches and the use of a good thread lubricant compound.

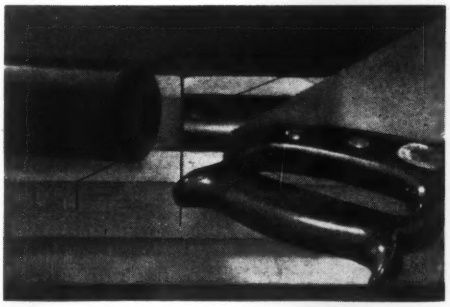
Solvent cementing is an efficient and effective means of joining PVC pipe Schedules 40, 80, and 120. Before joining, ends should be square cut; burrs removed; connecting surfaces cleaned with a cleaner; then solvent cement applied and the connection made. For a permanent installation, joining by solvent cement is recommended.

PVC pipe may also be joined by the use of heat welding. Either an inert gas or hot air gun may be used to heat a filler rod.

PVC may be joined to metal by the use of flange joints. Threaded joints between PVC and steel may give difficulty in some extreme services due to their difference in thermal expansion unless an elastic sealer is used.

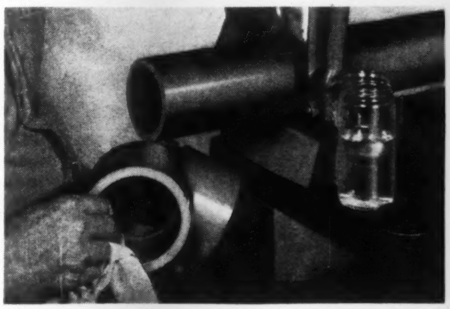
Solvent cementing and threading procedures are shown in the accompanying photos by courtesy of Tube Turns Plastics, Inc.

Solvent Cementing



1 FIELD CUTS of PVC pipe should be cut squarely, using a miter box and a fine saw. The mill ends are already smooth and square

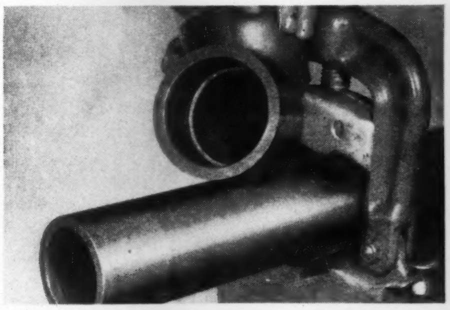
2 THE CUT END should be smoothed with a fine file before applying solvent cement, since both the pipe outside diameter and the end cross section are cemented



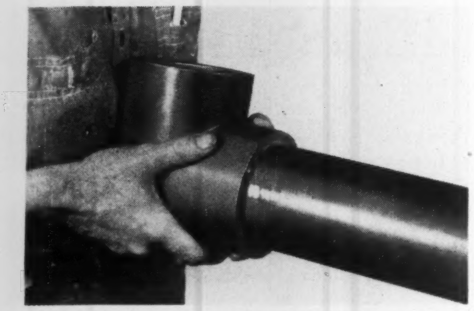
3 PRIOR TO CEMENTING the pipe OD, the end of the pipe, and the interior of the fitting should be cleaned with a clean cloth and a recommended cleaner

SOLVENT CEMENT

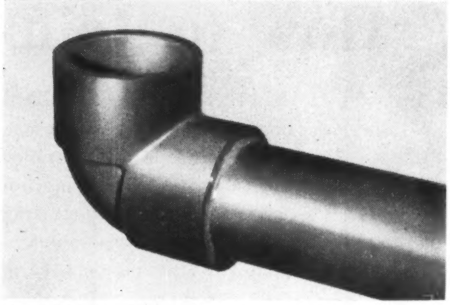
4 SOLVENT CEMENT should be generously applied with a clean brush both to the end and OD of the pipe for a good connection



5 SOLVENT CEMENT is also applied liberally to the corresponding surfaces in the fitting, including the socket end to insure cementing to the pipe end for a seal



6 THE FITTING is carefully slid over the end of the pipe and given a quarter turn to eliminate voids and to insure proper distribution



7 A SMALL FILET of cement will appear between pipe and fitting if the correct amount of cement has been used

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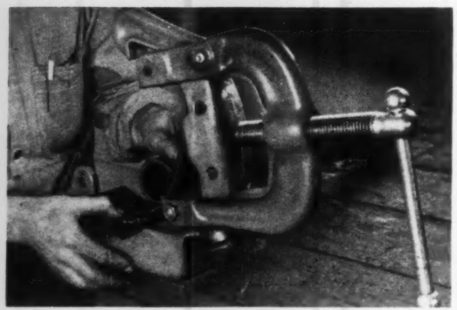
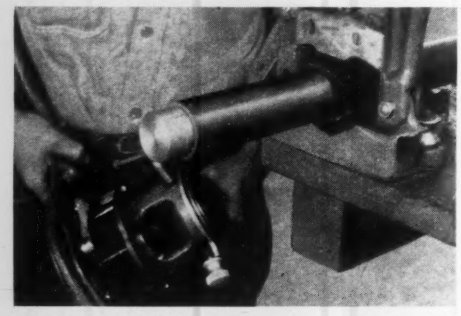
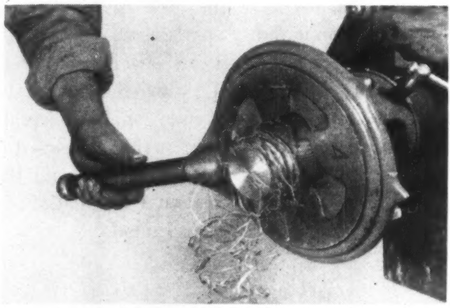
Threading



8 THREADING of PVC pipe can be readily done using standard steel pipe equipment. Inserts should be used in the pipe vise jaws to prevent scoring pipe

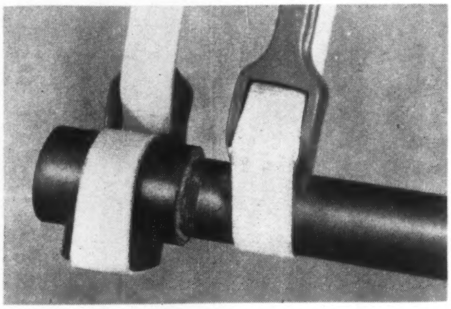


9 TO INSURE thread uniformity, particularly when threading the larger sizes 1 in. and over with heavy dies, the pipe should be held round by inserting a plug



10 PVC PIPE is readily threaded with sharp steel pipe dies without the use of either cutting fluids or lubricants

11 REGULAR PIPE DOPES can be used with PVC, but for corrosive services, an emulsion of an inert plastic compound should be used. Brush on a thin film



12 STRAP WRENCHES should be used to avoid scoring or nicking of PVC pipe or fittings. Little makeup over the hand-tight position is necessary

Heating, Piping & Air Conditioning

Journal Section

of the

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

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SOCIETY COMMITTEE ORGANIZATION

General Committees: The By-Laws provide for 9 such committees. The listing appears in this issue on page 156

Research Committees: The research program is under the guidance of the Committee on Research — a General Committee. The Committee on Research appoints Technical Advisory Committees as needed. Latest list, with current membership, appears in the June 1957 issue on page 182

Special Committees: At present there are 9 of these committees. The list of them and of their personnel can be found in this issue on page 156

Nominating Committee: This committee's membership is fixed by the By-Laws. The listing appears in this issue on page 156

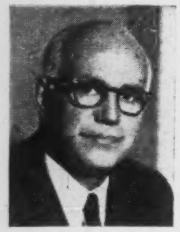
SOCIETY REGIONAL ORGANIZATION

The latest listing of the names of the Regional Directors and of the members of the Chapters Regional Committees appears in the April 1957 issue on page 176

SOCIETY CHAPTERS AND BRANCHES

The Society has chartered 69 Chapters, 1 Overseas Branch, and 6 Student Branches. These groups elect their officers and governing boards. A list of the presidents and secretaries appears in the July 1957 issue on pages 181-182

The President's Page



Semi-Annual Meeting

OTHER pages of the JOURNAL will provide more details and information concerning the successful Semi-Annual Meeting recently held at Murray Bay, Quebec, Canada. I want to extend my congratulations to the Montreal Chapter's Committee on Arrangements and the Society staff for their planning and providing so enjoyable and successful a Semi-Annual Meeting.

In addition to the 6 technical sessions, including the 2 symposia, many of the Society committees also met during the period of Saturday through Thursday. Council held its quarter-annual meeting on Sunday afternoon, June 23, with all 17 Council members present.

Included among the items considered by Council at its meeting were:

By-Law Changes: Recommendations, submitted by the Membership Committee, the Honors and Awards Committee, and the Charter and By-Laws Committee, that proposed revising and simplifying the method of selecting candidates for Honorary and Fellow grades of membership were approved by Council. In addition, Council also approved the suggested revisions of the By-Laws concerning the makeup of Council committees, which would increase these committees to include up to 5 members, 3 of whom would have to be members of Council. These proposed changes were read to those members in attendance at the opening session of the Semi-Annual Meeting, which, in turn, permits these proposed By-Law revisions to be submitted to the total membership for their vote and possible adoption in January 1958.

Finances: There are always many financial matters that require Council consideration at Council meetings. During this meeting of Council and the preliminary Finance Committee meeting, some time was devoted to a review of the present status of the 1957 operating budget, with some projection as to anticipated outcome by the end of the fiscal year. In addition, approval was granted for a preliminary operating procedure that has been prepared by the Finance Committee for the guidance of the Investment Advisory Subcommittee. This subcommittee now includes the president, the treasurer, and the chairman of the Finance Committee, and this committee is charged with supervising the activities of the Society's investment advisory counsel, the Bankers Trust Company of New York, in its management of the Society's investments.

The proposed enlarged Pension Plan for Society staff received a considerable amount of scrutiny during the Finance Committee meeting. The revised plan proposes a more realistic and up-to-date arrangement. Council instructed the Finance Committee to complete the development of the suggested plan now under consideration, to permit final Council action at the time of the October Council meeting. If approved at that time, it is intended that the revised plan will go into operation as of November 1, 1957, which date is the beginning of the next Society fiscal year.

New Chapters: Council at its May meeting authorized establishing a new chapter at Johnstown, Pa., and at its June meeting fixed the date for the charter meeting of the Johnstown Chapter for Friday, September 20.

Council, upon recommendation submitted by the Regions Central Committee, also approved the establishment of the 69th Chapter of the Society at Jacksonville, Fla., and set the date of July 9 as the time of the charter meeting.

Future Society Meetings: One interesting subject of considerable concern to Council is the problem of future Society meeting locations. The Executive Committee of Council acts as the coordinating agency on this matter, and, in its report to Council, submitted the following report on the present status of future meeting dates:

Year	Annual Meeting	Semi-Annual Meeting
1958	Pittsburgh	†Minneapolis
1959	*Philadelphia	Vancouver, B.C.
1960	**Dallas	Eastern location
1961	*Chicago	Open
1962	Open	Open
1963	*New York	Open

*With the regular biennial Exposition. **With the second Southwest Regional Exposition. †Joint meeting with *ASRE*.

Other Society matters considered by Council at this meeting concerned such items as Society research, the program for the Pittsburgh Meeting, and nominees for the 1958 Research Committee. These matters will receive more detailed reporting on other pages of this and subsequent issues of the JOURNAL SECTION.

P. B. Gordon

President

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

Pressure Losses and Flow Characteristics of Multiple-Leaf Dampers[†]

By Edward J. Brown[*] and Julian R. Fellows[**], Urbana, Ill.

SUMMARY — Multiple-leaf louver dampers have been used extensively to control the flow of air in heating, ventilating, and air-conditioning duct systems. The information presented herewith pertains to the pressure loss caused by dampers of that type. A method of utilizing pressure-loss data in determining the flow characteristic of a damper in a given system is presented. Typical flow characteristics for a number of damper and system combinations are also included.

THE OBJECTS of this investigation were: (1) to determine the resistance to air flow of multiple-leaf dampers for all leaf positions from wide open to closed; (2) to determine the effect of damper resistance on the control of air flow through a duct system; (3) to determine the effect of total system resistance on the flow-control characteristic of any particular damper.

Description of Apparatus

The information presented herewith pertains to the parallel- and opposed-leaf dampers listed in Table 1. The damper frames were 1/4 in. less on each dimension than the sizes listed in Table 1. The dimensions listed are those of the ducts in which the dampers were installed. The damper frames were constructed of 1/4-in. flat-bar stock. The damper leaves in every case were 1 in. less in length than the first dimension listed for the damper size. All dampers were equipped with 3/8-in. wide stop strips to fill the gap between the leaves and the frame. All of the leaves had crimped edges. The depth of the crimp was the same for all leaf heights.

Glossary of Terms

Crimped edge — edge of the leaf parallel to the axis is provided with a crimp to allow the leaves to overlap when closed and to add strength to the leaf (see Fig. 1).

Damper position — position of the damper leaves with respect to the plane of the frame, 0 deg (closed), 90 deg (open).

Frame dimensions — dimension parallel to the leaf axis is given as the first dimension. The second dimension given is measured perpendicular to the leaf axis.

Horizontal or vertical axis — orientation of the leaf axis depending on whether the damper is to be mounted in the duct with the leaf axis horizontal or vertical.

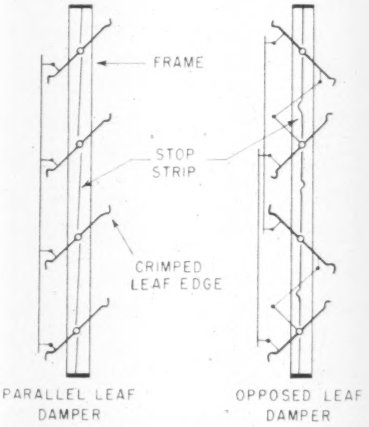


Fig. 1 — Two types of multiple-leaf dampers

Leaf height — height of a single leaf measured perpendicular to the leaf axis.

Leaf length to perimeter ratio — the sum of the lengths of all the leaves divided by the perimeter of the duct. Leaf length to perimeter ratio is abbreviated to *L/R* ratio.

Opposed-leaf damper — adjacent leaves rotate oppositely (see Fig. 1).

Parallel-leaf damper — all leaves remain parallel to one another as they are rotated (see Fig. 1).

Stop strips — strips of metal placed on the frame of the damper. The leaf ends and edges rest against the stop strips when the damper is closed. (see Fig. 1).

An elevation view of the fan and ductwork is shown in Fig. 2. The constant-speed fan was capable of delivering 1000 cfm of standard air against a static pressure of 7.5 in. water or 15,500 cfm of standard air against a static pressure of 0 in. water. The fan was directly connected to a 10 hp electric motor. The static pressure at Station 1 was adjusted by controlling, with the face and bypass damper, the volume of air entering the test duct. The face and bypass damper was operated by a reversible electric motor which could be stopped in any position. The switch for the control of this motor was located at the central gage board.

Flow straighteners of the tubular type, 3 in. in diameter and 10 in. in length, were included in the test arrangement. The air-flow measuring section consisted of a short converging entrance, a 14-in. diameter throat section which contained a fixed pitot-static tube located in the center of the throat section, and a long diverging section. The stationary pitot-static tube was calibrated by a 20-point pitot-static tube traverse at Station 2. Calibration tests were conducted at several flow rates and a calibration curve giving weight of standard air in pounds per hour plotted against velocity pressure at the fixed pitot-static tube was prepared from the data obtained. Velocity pressures at the measuring section were obtained with a micromanometer which could be read directly in increments as small as 0.001 in. water.

[†] This article includes the results in part of an investigation conducted in the Mechanical Engineering Laboratory of the University of Illinois under the terms of a cooperative agreement between the University and the Johnson Service Co.

[*] Research Assistant in Mechanical Engineering, University of Illinois.

[**] Professor of Mechanical Engineering, University of Illinois. Member of ASHAE.

For presentation at the 64th Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Pittsburgh, Pa., January 1958.

The duct section in which the test dampers were installed consisted of nine 44-in. sections of 3 × 4 ft duct mounted on movable stands. Each duct section was provided with 2-in. flanged joints. The face of one flange in each case was provided with a soft rubber gasket. This gasket was compressed when the duct sections were bolted together and prevented leakage of air at the duct joints. Four sections of this duct were on the upstream side and 5 sections were on the downstream side of the test damper. A baffle consisting of 4 layers of 16-mesh screen wire was placed upstream from the test damper to produce a more uniform air velocity in the duct immediately upstream from the face of the test damper.

Table 1 — Dampers Included in the Test Program

Damper Size, Inches	Type[a]	Damper[b] Axis	Number of Leaves	Leaf Height, Inches	Leaf Length, Inches	Perimeter, Inches	Total Leaf Length to Perimeter Ratio (L/R)
12x24	P	V	3	8½	11	72	0.46
12x32	P	V	4	8½	11	88	0.50
12x40	P	V	5	8½	11	104	0.53
12x48	P	V	6	8½	11	120	0.55
12x48	P	V	8	6½	11	120	0.73
12x48	P	V	4	12¼	11	120	0.37
12x36	P	H	4	9¼	11	96	0.46
24x36	P	H	4	9¼	23	120	0.77
36x36	P	H	4	9¼	35	144	0.98
48x36	P	H	4	9¼	47	168	1.12
24x36[c]	P	H	4	9½	20¾	120	0.69
12x32	O	V	4	8½	11	88	0.50
12x48	O	V	6	8½	11	120	0.55
12x48	O	V	8	6½	11	120	0.73
12x48	O	V	4	12¼	11	120	0.37
12x36	O	H	4	9¼	11	96	0.46
24x36	O	H	4	9¼	23	120	0.77
36x36	O	H	4	9¼	35	144	0.98
48x36	O	H	4	9¼	47	168	1.12
24x36[c]	O	H	4	9½	20¾	120	0.69
30x48[c]	O	H	5	9¾	27⅞	156	0.89

[a] P=Parallel leaf; O=opposed leaf.

[b] H=horizontal axis; V=vertical axis.

[c] Dampers not manufactured by sponsor.

The test dampers were bolted to the duct wall at the location indicated in Fig. 2. The joint between the damper frame and the duct wall was sealed with plastic tape. Horizontal and vertical partitions were provided in the 3 × 4 ft duct when needed to make a full-length duct the same size as any damper which was smaller in either length or height than the dimensions previously mentioned. This eliminated the necessity of providing a different duct for each damper size.

Piezometer rings located at Stations 3 and 4 and connected to an inclined water manometer provided damper pressure loss data. Pitot-static tube traverses indicated that the air stream filled the duct at Station 4 and that the velocity was the same as that at Station 3. Therefore, the total pressure loss between Stations 3 and 4 was assumed to be equal to the static-pressure loss between the same locations. The static-pressure loss was corrected for duct friction between Stations 3 and 4.

A second damper was installed at the end of the test duct to provide a means of varying the overall resistance of the duct system.

Test Procedure

Each damper was tested with 5 values of system resistance; namely, 1.5, 2.5, 3.5, 4.5, and 5.5 in. water. During each test run the system resistance (static pressure at Station 1) was maintained constant for all air flow rates, thereby simulating the use of a fan producing a flat static pressure characteristic. This was accomplished by operation of the face and bypass damper located just downstream from the fan. In each test run, the desired system resistance was established by means of the damper at the end of the test arrangement with the test damper in the 90 deg (open) position. The position of the end damper was maintained for all of the test-damper leaf positions from 90 to 0 deg. In each case, the test-damper leaf positions were changed by 10 deg increments as the test progressed. The required data were recorded for each position.

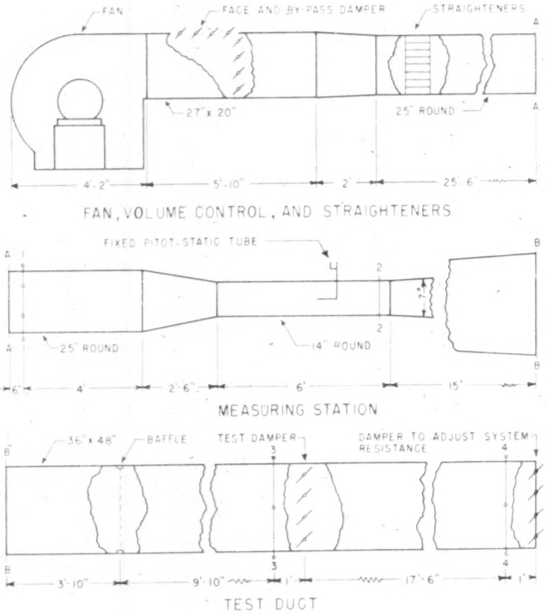


Fig. 2 — Arrangement of test equipment

Fan, System, and Damper

Fig. 3 illustrates the relation between the static-pressure characteristic of a fan and the resistance characteristic of the duct system to which it is connected. The resistance of the duct system varies approximately as the square of the volume flowing through it. The intersection of Curve 1 and the fan characteristic curve indicates the volume of air that the fan will cause to flow through the duct system. Curve 2 represents the same system with the addition of an open damper. The resistance of the open damper decreases the air flow as indicated by the intersection of the fan characteristic curve and Curve 2. As will be explained later, the ratio of the wide open damper resistance, *A*, to the system resistance including the damper, *B*, is important in determining the ability of the damper to control the flow of air through the system in a satisfactory manner. The ratio of *A* to *B* is constant as long as the system remains constant, regardless of the volume of air handled. Thus, *A*/*B* with 4000 cfm flowing through the system is equal to *A*/*B* with 7000 cfm flowing through the same system.

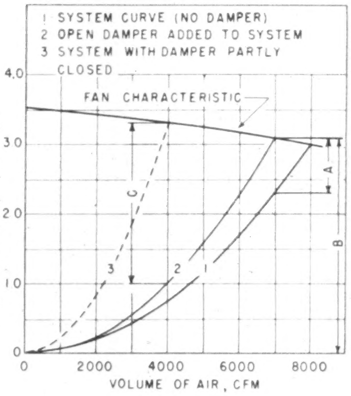


Fig. 3 — Control of air flow with a damper

Partially closing the damper modifies the system and reduces the air flow. Note the intersection of Curve 3 and the fan characteristic curve in Fig. 3. The partially closed damper adds resistance to the system equal to the difference, *C*, between Curves 2 and 3.

To decrease the flow of air through a duct system, resistance such as *C* in Fig. 3 must be added by turning the damper leaves from their wide open position. The resistance which must be added to a system for any specified flow rate between maximum and minimum may be determined by deducting the system resistance at that flow rate from the static pressure produced by the fan at the same flow rate. The damper leaf position required to create the additional resistance may be determined if information pertaining to the resistance of the damper at all leaf positions is available.

Resistance of Dampers to Air Flow

The resistance of the damper for any one leaf position varies as the square of the volume of air passing through the damper or as the square of the velocity of the air approaching the damper. The resistance or pressure loss caused by any leaf position is dependent on the free area of the damper as compared to the duct cross-sectional area. The free area of a damper includes the open area between the leaves plus the area between the leaves and the damper frame. The ratio of free area to duct cross-sectional area, for a given leaf position, is not constant for all dampers. The area between the leaf ends and the damper frame is nearly constant regardless of leaf length. Thus, for a given leaf position, the ratio of free area to duct cross-sectional area decreases as leaf length increases.

Measurement of the free area of a damper is very difficult for leaf positions other than 90 deg. Therefore, the measured values of pressure loss for each leaf position were expressed as that loss which would be caused by an abrupt expansion of the air stream from an equivalent contracted area to the duct cross-sectional area.

The Borda formula[1] for the loss of total head resulting from an abrupt expansion is,

$$H_t = (V_1 - V_2)^2/2_g \quad \ldots(1)$$

where H_t is the total pressure lost in feet of fluid flowing, V_1 is the velocity of the air stream in the smaller area, V_2 is the velocity in the larger area (see Fig. 4).

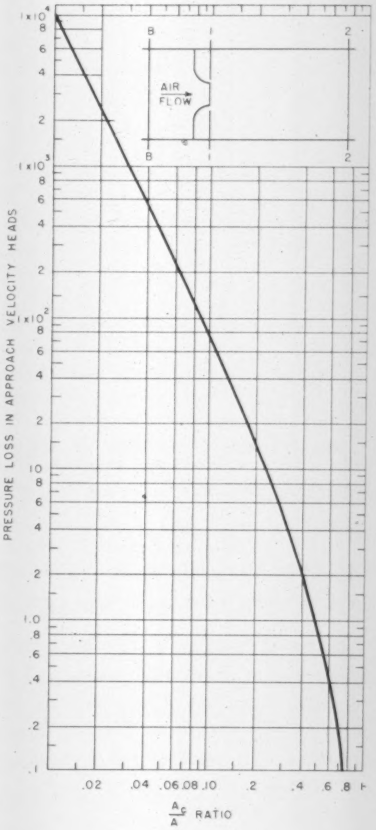


Fig. 4 — Pressure loss due to abrupt expansion

$$\text{Since } A_1V_1 = A_2V_2 \quad \ldots\ldots\ldots\ldots(2)$$

where A_1 and A_2 are the small and large areas, respectively, the loss may be expressed in terms of the velocity in the large stream. It is convenient in this application to express the loss in this manner, since the velocity in the damper flow area is difficult to measure.

---

[1] Pressure Losses Resulting from Changes in Cross-Sectional Area in Air Ducts, by A. P. Kratz and J. R. Fellows (University of Illinois Engineering Experiment Station *Bulletin No.* 300).

$$\text{Then } H_t = [(A_2/A_1) - 1]^2 (V_2^2/2g) \quad \ldots\ldots\ldots(3)$$

The nozzle area of Section 1, Fig. 4, represents the equivalent contracted area, and Section 2, the duct area downstream from the damper. The abrupt expansion is assumed to occur as the stream at Section 1 expands to the dimensions of the duct at Section 2. The loss is H_t, given by Equation 3.

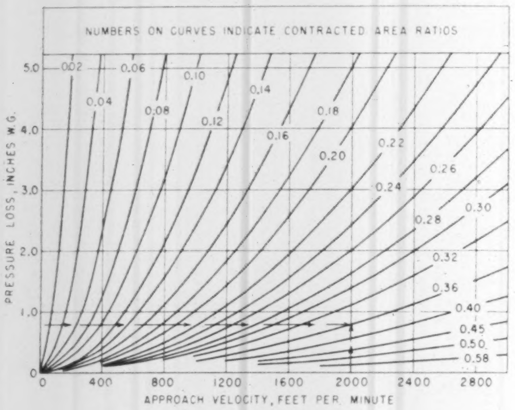


Fig. 5 (above) — Effect of equivalent contracted area ratio on pressure loss

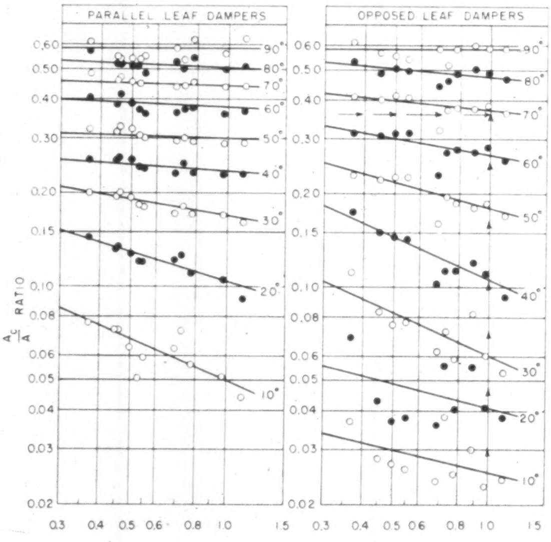


Fig. 6 (right) — Effect of L/R ratio on the A_c/A ratio

If Equation 3 is rearranged in the form

$$[H_t/(V_2^2/2g)] = [(A_2/A_1) - 1]^2$$

the loss is then expressed in terms of velocity heads referred to the velocity either at Section 2 or at Section B, Fig. 4.

Since H_t and V_2 were known from the test data, it was possible to determine either A_2/A_1 or its reciprocal A_1/A_2 for each leaf position for all dampers tested. A_1/A_2 is the equivalent contracted area ratio. From here on in this discussion, the contracted area ratio will be referred to as A_c/A where A_c is the equivalent contracted area caused by the damper and A is the duct cross-sectional area.

A plot of the loss expressed as velocity heads referred to the velocity of the air approaching the damper, against the A_c/A ratio is given in Fig. 4. The curves of Fig. 5 were obtained from Fig. 4 by determining the loss for each of several A_c/A ratios over a range of approach velocities from 0 to 2800 fpm. The resulting losses expressed in terms of inches of water were plotted against approach velocity. Each A_c/A ratio corresponds to a leaf position. For instance, the 0.58 A_c/A ratio expresses the pressure loss or resistance of the wide open damper (leaves at the 90 deg position). To use the information presented in Fig. 5 for a particular damper, it is necessary to know the relation which exists between the A_c/A ratio and that damper's dimensions. The leaf length to perimeter (L/R) ratio may be readily determined from the frame and leaf dimensions of the damper.

Fig. 6 shows the experimentally determined relationship between the A_c/A ratio and the L/R ratio for 9 damper positions for all of the parallel-leaf and opposed-leaf dampers tested. The L/R ratios for these dampers are listed in Table 1. With this information the resistance for any leaf position of a particular damper may be determined.

To determine the resistance of a given damper at any position, it is necessary first to locate the intersection points of the damper's L/R ratio line and the damper position line in Fig. 6. The A_c/A ratio found at the point of intersection is then used with the approach velocity and Fig. 5 to determine the resistance of the damper. For example, the A_c/A ratio for the 50 deg position of a parallel-leaf damper with an L/R ratio of 0.8 is 0.3 from Fig. 6. The resistance of the damper at this position with an approach velocity of 2400 fpm is 2.0 in. water from Fig. 5.

The influence of the L/R ratio on the A_c/A ratio is illustrated by the slope of the curves in Fig. 6. That is, as the number of leaves in a given frame size is increased, the A_c/A ratio is decreased and the resistance of the damper is increased, which is to be expected. Also as the L/R ratio increases, the area at the end of the leaves becomes a lesser part of the total flow area and descreases the A_c/A ratio for a given leaf position.

The depth of the crimp at the leaf edges was constant for all leaf heights, with the result that the leaves of different heights were not geometrically similar. It was assumed that the lack of geometric similarity was of limited significance for the range of leaf heights included in the test results.

Fig. 6 indicates a greater A_c/A ratio for a given damper leaf position (with the exception of the 90 deg position) for parallel-leaf dampers as compared to opposed-leaf dampers. Thus, the pressure loss for a given velocity and leaf position is less for parallel-leaf dampers than for opposed-leaf dampers. The average A_c/A ratio for the 90 deg position of both parallel- and opposed-leaf dampers is equal to 0.58 which results in a loss of approximately 1/2 of a velocity head referred to the approach velocity (see Fig. 4). This is a convenient number to use in system design calculations for the pressure loss caused by an open-multiple-leaf damper.

Fig. 6 includes data on dampers manufactured by 2 different companies other than the sponsor. All of the dampers tested were nearly identical in leaf construction. Therefore, it is not surprising that the results obtained were similar. It appears that the data presented may be applied to any multiple-leaf damper similar to those of Fig. 1.

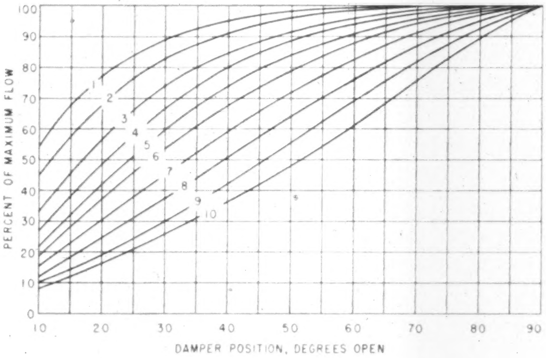


Fig. 7 — Parallel-leaf damper flow characteristics

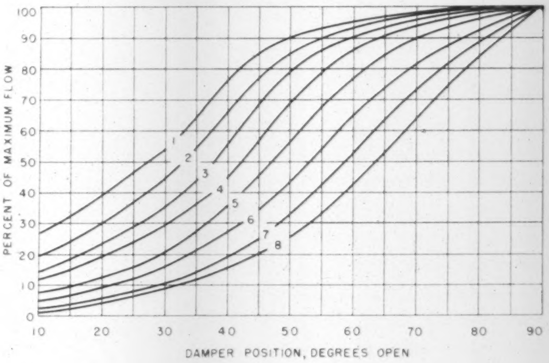


Fig. 8 — Opposed-leaf damper flow characteristics

Table 2 — Ratios of Damper Resistance to System Resistance which Apply to Flow Characteristics in Figs. 7 and 8

Fig. 7 Parallel-Leaf Dampers		Fig. 8 Opposed-Leaf Dampers	
Open Damper Resistance in Percent of System Resistance	Flow Characteristic	Open Damper Resistance in Percent of System Resistance	Flow Characteristic
0.5 — 1.0	1	0.25 — 0.50	1
1.0 — 1.5	2	0.50 — 0.75	2
1.5 — 2.5	3	0.75 — 1.50	3
2.5 — 3.5	4	1.5 — 2.5	4
3.5 — 5.5	5	2.5 — 5.5	5
5.5 — 9.0	6	5.5 — 13.50	6
9.0 — 15.0	7	13.5 — 25.5	7
15.0 — 20.0	8	25.5 — 37.5	8
20.0 — 30.0	9		
30.0 — 50.0	10		

Typical Flow

Characteristic Curves

The flow characteristic of any damper-system combination is the relation between the percent of air flowing and the leaf position of the damper. It is a graphical representation of the damper's ability to control air flow. The flow characteristic is dependent on the ratio of the damper's resistance to the resistance of the system in which it is installed. Dickey and Coplen[2] utilized the resistance of the damper at its 30 percent open position in relation to the total system resistance to predict damper performance. In this investigation, the ratio of the wide open damper resistance to system resistance has been used as an index of the damper's ability to control air flow (the ratio A/B in Fig. 3). In either case, if the damper resistance constitutes a large part of the total system resistance, any change in damper position will alter the system resistance sufficiently to increase or decrease the air flow through the system.

Fig. 7 shows typical flow characteristics of parallel-leaf dampers. The left half of Table 2 lists the damper resistance as a percent of system resistance which must exist for each typical curve of Fig. 7.

Curve 1 of Fig. 7 represents a poor flow characteristic, since a great amount of damper movement is required to reduce the flow. In this case the open-damper resistance is one percent or less of the system resistance. (See Table 2). Consequently, the leaves must be moved a great number of degrees from the open position before sufficient resistance is added to the original system to reduce the flow. The damper controls 90 percent of the flow in the first 30 deg of movement from the closed position. It is desirable to control the flow uniformly over the full 90 deg of damper movement.

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[2] A Study of Damper Characteristics, by P. S. Dickey and H. L. Coplen (*ASME* Transactions, Vol. 64, 1942, pp. 137-154).

Curve 8 represents a good flow characteristic since flow is nearly directly proportional to damper position. Several combinations of approach velocity and system resistance may result in the same ratio of damper resistance to system resistance and, consequently, the same flow characteristic. Table 3 lists several conditions of system resistance and approach velocity for each typical flow characteristic curve.

Fig. 8 shows typical flow characteristics of opposed-leaf dampers. The right half of Table 2 lists the damper resistance as a percent of system resistance which must exist for each typical curve of Fig. 8. Table 4 lists the approach velocity and system resistance conditions which pertain to each curve of Fig. 8.

The curves of Figs. 7 and 8 apply to dampers with an L/R ratio of 1.0 but may also be applied to other dampers having L/R ratios of 0.3 to 1.2 without introducing an appreciable error. The curves are strictly applicable only to systems in which the static pressure at the entrance to the system is maintained constant from 0 to 100 percent flow. However, the curves present a general picture of the flow characteristics of parallel- and opposed-leaf dampers. Particularly, the curves illustrate that, for a given set of conditions, a better characteristic may be obtained with an opposed-leaf damper than with a parallel-leaf damper.

The following example will illustrate the steps which were necessary in determining each of the typical flow characteristic curves of Figs. 7 and 8.

Example: Assume that an opposed-leaf damper with an L/R ratio of 1.0 is installed in a system in which the approach velocity with the damper wide open is 2500 fpm. The resistance of the system including that of the open damper is 2.0 in. water. Determine the damper flow characteristic assuming that the fan will maintain a constant static pressure at its outlet. (The fan exit is considered to be the entrance of the system.)

To determine the flow characteristic it is necessary to know: (1) The approach velocity for each percent of maximum flow that is to be tabulated; (2) The system resistance (including the resistance of the wide open damper) for each tabulated percent of maximum flow; (3) The additional resistance which must be supplied by the damper to maintain each tabulated percent of maximum flow; (4) The A_c/A ratio which will supply the additional resistance needed in each case; (5) The damper position which is related to each A_c/A ratio that is needed.

Table 5 lists the values of velocity, system resistance, additional resistance to be supplied by the damper, the A_c/A ratios, and the damper positions related to these A_c/A ratios. The data in Column 3 are based on the assumption that the resistance of the wide open damper and duct system varies as the square of the volume of air flowing. Thus, at 80 percent flow the resistance of the duct and open damper is 0.64 times 2.0 in. or 1.28 in. water. The additional resistance values in Column 4 are the result of subtracting Column 3 values from 2.0 in. water. The additional resistance must be supplied by decreasing the A_c/A ratio. The resistance is in addition to that of the system and the open damper. The A_c/A ratio of 0.36 necessary for 80 percent flow (2000 fpm) was obtained from Fig. 5 by proceeding vertically on the 2000 fpm line to the pressure loss line of 0.85 in. water which is 0.72 in. water above the resistance of the open damper (0.13 in. water) at 2000 fpm. The velocity and pressure loss lines intersect at an A_c/A ratio of 0.36 (see arrows on Fig. 5). The damper position of 69 deg was obtained from Fig. 6 at the intersection of the 0.36 A_c/A line and the 1.0 L/R line (see arrows on Fig. 6). The damper positions necessary for the other flow rates were obtained in the same manner. The flow rates in Column 1 plotted against the damper positions in Column 5 describe the flow characteristic. Curve 6 of Fig. 8 represents the flow characteristic of this example. All of the flow characteristics presented in Figs. 7 and 8 were developed by the method just described. The validity of the flow characteristic curves has been confirmed by tests conducted under conditions similar to those listed in Tables 3 and 4.

The exact flow characteristic for any damper-duct-fan system may be developed from the information given in Figs. 5 and 6. However, the representative flow characteristics of Figs. 7 and 8 and the conditions of Tables 2, 3, and 4 necessary for these characteristics to exist eliminate the

Table 3 — Typical Conditions of Velocity and System Resistance which Apply to the Parallel Leaf Damper Flow Characteristics of Fig. 7

Total[a] System Res., Inches Water	Approach Velocity fpm With Damper Wide Open										
	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Flow Characteristic Number										
0.5	3	5	6	7	8	9	9	10	10	10	10
0.6	3	5	6	7	8	9	9	10	10	10	10
0.7	2	4	6	7	7	8	9	10	10	10	10
0.8	2	4	5	6	7	8	9	9	10	10	10
0.9	2	4	5	6	7	7	8	9	9	10	10
1.0	2	3	5	6	7	7	8	9	9	10	10
1.1	2	3	5	6	6	7	8	8	9	9	10
1.2	2	3	4	5	6	7	7	8	9	9	10
1.3	2	3	4	5	6	7	7	8	9	9	10
1.4	1	3	4	5	6	7	7	8	8	9	9
1.5	1	3	4	5	6	6	7	7	8	9	9
1.6	1	2	4	5	6	6	7	7	8	9	9
1.7	1	2	3	5	6	6	7	7	8	8	9
1.8	1	2	3	5	5	6	6	7	8	8	9
1.9	1	2	3	5	5	6	6	7	7	8	9
2.0	1	2	3	4	5	6	6	7	7	8	8
2.2	-	1	3	4	5	6	6	7	7	8	8
2.4	-	1	3	4	5	5	6	6	7	7	8
2.5	-	1	3	4	5	5	6	6	7	7	8
2.6	-	1	3	4	5	5	6	6	7	7	8
2.8	-	1	2	3	4	5	6	6	7	7	7
3.0	-	1	2	3	4	5	5	6	6	7	7

[a] Total system resistance is the sum of the resistances of the ductwork, the damper, and all other elements included in the system with the damper wide open and the maximum quantity of air flowing through the system.

need for developing flow characteristics except for special cases which are not covered by these curves.

Examples of the Use of the Flow Characteristic Curves

Example 1: A parallel-leaf damper is installed in a branch duct. The velocity in the branch duct is 1000 fpm. The static pressure at the branch duct inlet is 1.0 in. water and is assumed to remain constant regardless of the flow in the branch duct. (In this case the system consists of the branch duct and any equipment such as coils, filters, or the damper included in the duct. The system resistance is equal to the static pressure of 1.0 in. water.)

Table 4 — Typical Conditions of Velocity and System Resistance which Apply to the Opposed Leaf Damper Flow Characteristics of Fig. 8

Total[a] System Res., Inches Water	Approach Velocity fpm With Damper Wide Open										
	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
	Flow Characteristic Number										
0.5	3	5	6	6	7	7	7	8	8	8	8
0.6	3	4	5	6	6	7	7	7	8	8	8
0.7	3	4	5	6	6	6	7	7	7	8	8
0.8	3	4	5	5	6	6	7	7	7	8	8
0.9	3	4	5	5	6	6	6	7	7	8	8
1.0	3	4	5	5	6	6	6	7	7	7	8
1.1	2	3	4	5	6	6	6	6	7	7	7
1.2	2	3	4	5	5	6	6	6	7	7	7
1.3	2	3	4	5	5	6	6	6	6	7	7
1.4	2	3	4	5	5	6	6	6	6	7	7
1.5	2	3	4	5	5	6	6	6	6	7	7
1.6	2	3	4	5	5	5	6	6	6	7	7
1.7	2	3	4	4	5	5	6	6	6	6	7
1.8	2	3	4	4	5	5	6	6	6	6	7
1.9	1	3	3	4	5	5	6	6	6	6	6
2.0	1	3	3	4	5	5	6	6	6	6	6
2.2	1	3	3	4	5	5	5	6	6	6	6
2.4	1	2	3	4	4	5	5	5	6	6	6
2.5	1	2	3	4	4	5	5	5	6	6	6
2.6	1	2	3	4	4	5	5	5	6	6	6
2.8	1	2	3	3	4	5	5	5	6	6	6
3.0	1	2	3	3	4	5	5	5	6	6	6

[a] Total system resistance is the sum of the resistances of the ductwork, the damper, and all other elements included in the system with the damper wide open and the maximum quantity of air flowing through the system.

Table 5 — Tabulated Values Required for Example

1	2	3	4	5	6
Flow in Percent of Max. Flow	Approach Velocity, fpm	Total System Resistance Including Open Damper, Inches Water	Additional Resistance Required from Damper, Inches Water	A_e/A Ratio to Supply Additional Resistance	Damper Position Corresponding to A_e/A Ratio
100	2500	2.0	0	-	-
90	2250	1.62	0.38	0.44	77
80	2000	1.28	0.72	0.36	69
70	1750	0.98	1.02	0.29	63
60	1500	0.72	1.28	0.24	58
50	1250	0.50	1.50	0.20	53
40	1000	0.32	1.68	0.16	48
30	750	0.18	1.82	0.12	42
20	500	0.08	1.92	0.08	35
10	250	0.02	1.98	0.05	25

1. *What flow characteristic will result from these conditions?*

2. *If the parallel-leaf damper is replaced by an opposed-leaf damper, what flow characteristic will result?*

Solution:

1. Referring to Table 3, the velocity and system resistance conditions indicate that Curve 5 of Fig. 7 is the representative flow characteristic for a parallel-leaf damper in this system.

2. Referring to Table 4, the velocity and system resistance conditions indicate that Curve 5 of Fig. 8 is the representative flow characteristic for an opposed-leaf damper in this system. The opposed-leaf damper has a more desirable characteristic than does the parallel-leaf damper.

Example 2: An opposed-leaf damper is installed in a 24 in. × 24 in. duct. With the damper wide open, 16,000 cfm of standard air flows through the system. The resistance of the system including the damper is 4.0 in. water. What volume of air will flow through the system if the damper position is changed to 35 deg?

Solution: The flow of 16,000 cfm results in an approach velocity of 4000 fpm. These conditions of velocity and system resistance are not listed in Table 4. However, the flow characteristic may be determined from Table 2 and Fig. 8 if the ratio of the damper's resistance to the system resistance is established. Since the A_e/A ratio of the open damper is equal to 0.58, the resistance of the open damper in terms of approach velocity heads as given by Fig. 4 is 0.5 velocity heads. The velocity head for 4000 fpm is approximately 1.0 in. water. The damper resistance is then 0.5 in. water. The ratio of damper resistance to system resistance is 0.5/4.0 or 12.5 percent. 12.5 percent is within the range of 5.5 to 13.5 percent listed for flow characteristic 6 in Table 2. Curve 6 of Fig. 8 indicates a flow of 20 percent of maximum for the 35 deg position. The flow rate for the 35 deg position is 20 percent of 16,000 cfm or 3200 cfm.

Conclusions

1. The flow of air as controlled by a damper is dependent on the damper's ability to change the resistance of the system as its position is changed.

2. The resistance of a damper at any position of its leaves is dependent on its equivalent contracted area ratio at that position.

3. The contracted area ratio for any given leaf position varies with the damper's leaf length to frame perimeter (L/R) ratio.

4. The pressure loss of an open damper of the types tested is equivalent to ½ of a velocity head referred to the approach velocity.

5. A flow characteristic for any damper-fan-duct system may be developed if the fan static pressure characteristic is known and data are available which relate damper resistance to leaf position and approach velocity.

6. If a constant static pressure is assumed at the system entrance for 0 to 100 percent flow, the flow characteristics of Figs. 7 and 8 may be applied to any conditions listed in Table 2 or Tables 3 and 4.

7. In most cases for the same conditions of approach velocity and system resistance the flow characteristic of an opposed-leaf damper is better than the flow characteristic of a parallel-leaf damper.

Control of High-Velocity Single-Duct Systems

By

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The author is Manager, Product Engineering, Automatic Control Division, Barber-Coleman Co., Rockford, Ill. The presentation was made at the Symposium on Air-Conditioning Instrumentation at the Semi-Annual Meeting of the American Society of Heating and Air-Conditioning Engineers, Murray Bay, Que., Canada, June 24, 1957.

Control of high-velocity single-duct systems is, in most cases, identical to controlling systems of conventional velocities and pressures. How the air is distributed to the various spaces is usually immaterial as far as the controls themselves are concerned. High velocity does, however, enable one to design certain types of systems that heretofore were impractical at conventional velocity and pressure. Before going too far into the field, perhaps it would be better to define what is meant by high-velocity air distribution. High-velocity air distribution is where the velocity and/or pressure is of sufficient magnitude that special treatment of the ducts and outlets is required in order to deliver that air at a reasonable noise level. Usually this is taken as velocities in excess of 2000 fpm and/or pressures in excess of 2 in. water. By using high-pressure high-velocity air distribution, certain advantages are realized, such as: (1) space saving feature due to smaller ducts; (2) ease in balancing due to all outlets having sufficient pressure available at all times; (3) improved performance due to distribution remaining relatively constant at all times.

One of the most common examples of a single-duct high-velocity system is the zone reheat system (Fig. 1). Here the building is divided into a number of zones based on occupancy and external load variations. Air is conditioned at the central fan room and delivered to the space through small high-velocity ducts. The ducts terminate in a high-pressure sound box where the air is converted to conventional pressure and velocity before being admitted to the space through appropriate grilles or ceiling diffusers. The sound box, Fig. 2, is nothing more than a pressure reducing valve with sound trap and a damper arrangement, usually referred to as an air valve, for the purpose of balancing. In many cases, an octopus type of box is used for reasons of economy so that one unit can serve several outlets (see Fig. 3).

The controls for such a system are similar to controls for any system of this type; a typical example of which is shown in Fig. 4. The quantity of outside air taken into the sys-

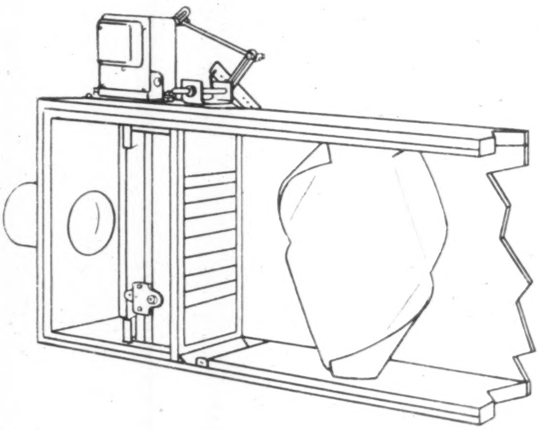


Fig. 2 — High-pressure sound box

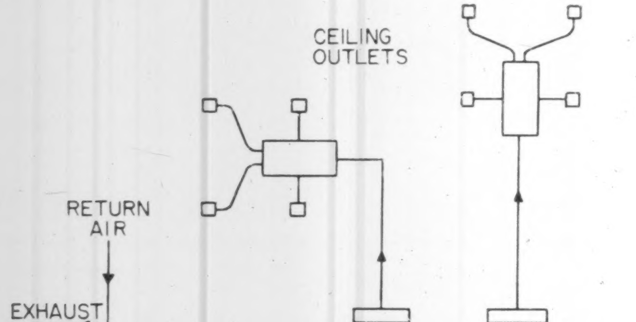


Fig. 1 — Single-duct high-velocity system — zone re-heat

tem is controlled by thermostat T_1 set to maintain approximately 60 F. As the outside temperature drops, T_1 will close the outside air until a minimum is reached as determined by the selector switch S_1. Below this point, T_1 can no longer hold the mixture at 60 F. The chart, Fig. 5, shows mixture temperature for various outdoor conditions at various percentages. Above 60 F outside, the outside air dampers will be wide open for maximum atmospheric cooling. When outside temperature reaches the point where it has no cooling value, thermostat T_2 closes the outside air to the minimum setting; such a cycle is often called the *Economizer Control.* It has certain decided advantages, especially in a system such as this, where there are several zones: (1) it maintains a constant entering coil temperature (as long as T_1 is in control), thereby simplifying the job of the other controls; (2) it provides independent control of outside air simplifying the control sequence; (3) it provides an inherent system low limit, for if any reheat valve should close, the coldest air available is 60 F.

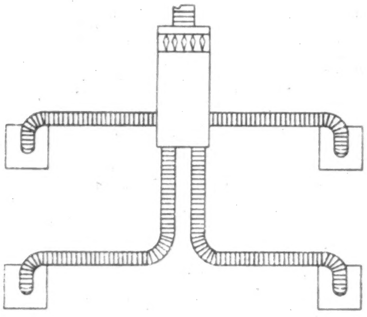


Fig. 3 — Single sound box arranged to serve several outlets

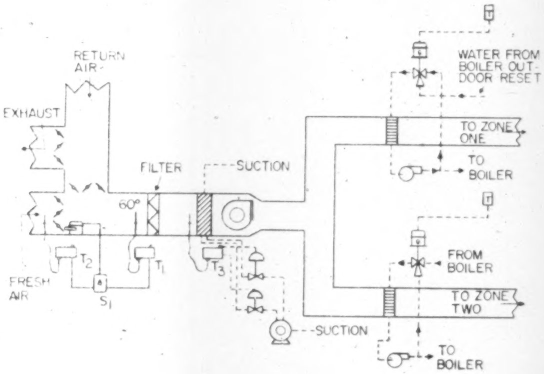


Fig. 4 — Controls for single-duct reheat system

Individual zone control is from a room thermostat positioning a 3-way valve on the heating coil. Note that the valve is piped for constant flow through the coil with the valve changing the temperature of the water by mixing varying amounts of boiler water with recirculated water. As shown, this requires a circulating pump for each coil.

Refrigeration control is from a thermostat in the mixed air starting stages of refrigeration as the mixed air temperature rises; for example, first stage on at 70 F, second stage at 80 F. As an alternate, the closing of one or more zone valves can start the refrigeration machine.

A reheat system, such as this, has some decided advantages: (1) Cold enough air is available at all times either from outdoors or by mechanical refrigeration simplifying the control on each zone; there is no complicated *summer-winter* changeover circuiting. (2) Reheating provides excellent control of the latent load within the space. (3) It solves the problem of having to control a direct expansion machine at greatly reduced capacity which is often difficult and usually ends up in short cycling.

Another type of single-duct high-velocity system, although it does come very close to infringing on the double-duct system, is the high-velocity multi-zone system. A double mixing box at each zone, consisting of 2 air valves and a turbulator, mix the proper quantity of hot and cold air to maintain space temperature. From the mixing box, air still at high pressure is delivered through a single small duct to an octopus box where it is converted to low pressure and discharged into the space through several outlets, Fig. 6.

OUTDOOR AIR TEMP	MIXED AIR TEMPERATURE WITH R.A. AT 70° AND VARIOUS % OF OUTDOOR AIR			
	10%	25%	33-1/3%	50%
-10°	62°	50°	43°	30°
0°	63°	52-1/2°	47°	35°
20°	64°	55°	50°	40°
20°	65°	57-1/2°	54°	45°
30°	66°	60°	57°	50°
40°	57°	62-1/2°	60°	55°
50°	68°	65°	63°	60°
60°	69°	67-1/2°	67°	65°

Fig. 5 — Tabulation of mixed air temperatures

As illustrated in Fig. 7, outside air control is again the economizer cycle where a mixed air thermostat maintains the mixture temperature at some level, say 60 F. In the winter cycle this mixture temperature becomes the cold deck temperature. The hot deck during the winter cycle is controlled by a thermostat in the discharge from the hot coil. In this particular case, a steam valve is shown, although the system could also use hot water if desired. When using steam, a long averaging element, having an active winding about 22 ft long, is highly desirable as the coil has a great tendency to stratify at reduced load. Usually the hot deck temperature is outdoor reset to help match the load to space requirements. Cold deck control is usually handled by allowing any one of the zone control units to turn on the compressor, should it reach the full cooling end of its stroke. Often it is found that one or so small interior zones will turn on the compressor first. Sometimes these zones are so small in proportion to the total load that, if allowed to start the compressor, serious short cycling results. Built-in unloaders help this situation greatly, but sometimes this is not enough, and the small zones have to be disconnected from the compressor circuit.

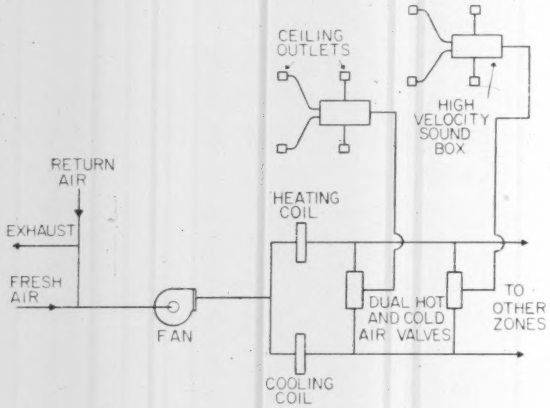

CEILING OUTLETS
HIGH VELOCITY SOUND BOX
RETURN AIR
HEATING COIL
EXHAUST
FRESH AIR
FAN
DUAL HOT AND COLD AIR VALVES
TO OTHER ZONES
COOLING COIL

Fig. 6 — High-velocity multi-zone system

As can be seen, the control problems for this type of unit are identical to what is called the multi-zone unit. This is, in effect, a multi-zone using high velocity so as to reduce duct sizes throughout the interior.

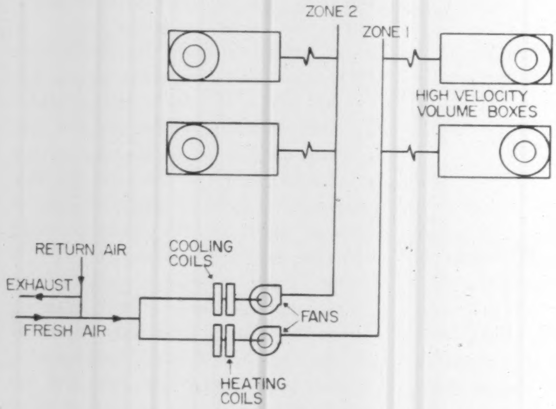

ZONE 2
ZONE 1
HIGH VELOCITY VOLUME BOXES
RETURN AIR
COOLING COILS
EXHAUST
FANS
FRESH AIR
HEATING COILS

Fig. 8 — Single-duct volume control system

A third type of high-velocity single-duct control that has been successfully applied is the volume control system, Fig. 8. Volume type of control systems have, in the past, been difficult to use. This has been due to the strong effect closing of one damper had upon the others. High velocity helps a great deal in this respect. By having a high-pressure distribution system, high-pressure drops can be taken across the control valves. The higher the pressure drop across the valve, as compared to the pressure drop in the duct leading up to the valve, the less will be the effect upon the other valves as one or more units close down. This makes it possible to design a high regain system which will keep changes in static to a minimum. The chart, Fig. 9, shows what effect relative pressure drops have on the flow characteristics of the control valve. Note that, if one can allow a pressure drop across the valve equal to the duct loss leading up to the valve under maximum flow conditions (50 percent drop), the curve becomes reasonably straight. This is because the change in static does not build up excessively when the valve closes. Also, this helps to minimize the rise in pressure at the other valves further down the line, should one or more zone valves close down.

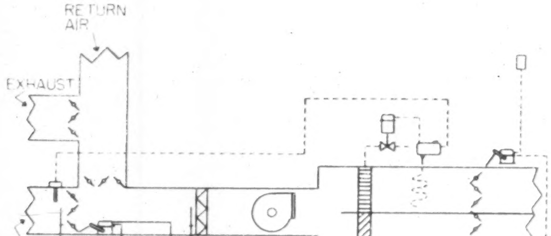

RETURN AIR
EXHAUST
FRESH AIR
COMPRESSOR STARTED BY ZONE MOTOR

Fig. 7 — Control diagram of high-velocity multi-zone system

In order to maintain good air distribution, it has been established that the volume controls cannot close below 33 percent of maximum flow without impairing the distribution. Consequently, the valves are linked so that when calling for maximum they are wide open, but when calling for minimum flow, the valve cannot travel beyond the 33 percent point.

This means that volume control type of jobs are applicable only if it has first been determined that the variation in load between zones does not exceed 66 percent for any given outdoor condition. In other words, the internal heat gain for each zone cannot vary from another by more than 66 percent. If it did, the volume type of system could not keep up with the changes.

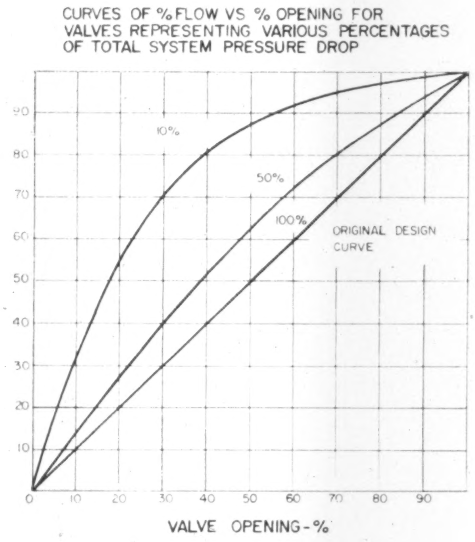


Fig. 9 — Effect of relative pressure drop on control valve flow characteristics

Because of this limited turn down ratio, it is extremely important that the building be zoned properly, Fig. 10, so that the air delivered to the various zones can be outdoor reset. The outdoor reset controls play a very important part in this kind of system, and must be accurately adjusted so as to relieve the burden of control from the room controls. This usually means that it is necessary to have 2 outdoor reset schedules; one for when the building is occupied, and the other for unoccupied conditions. If the system is merely turned off during a period of no occupancy, then it is necessary to override the outdoor reset controls during the warm-up cycle.

Outdoor reset control should be employed during the summer cycle also. Unless precautions are taken, this could result in muggy conditions out in this space due to a loss in latent heat when the air was being delivered at a temperature dictated by the outside dry-bulb temperature. Moisture regain in a space is usually relatively constant, so if the air is lowered to the proper dew-point before delivery, this condition can be avoided. Under some circumstances reheat may be required.

The room control is an individual thermostat and actuator positioning the volume dampers. Because the direction of movement of the actuator must be reversed from heating to cooling, *summer-winter* changeover is required. This can be done from a central point; however, the most economical method has been to incorporate an inexpensive thermostat in the supply air to each valve set at approximately 70 F to reverse the action depending upon whether the supply air is above or below the set point.

Again, the octopus box provides the most economical approach to the problem. A single box and set of controls can be employed to deliver air to several outlets, thereby reducing the amount of equipment required.

The volume control type of system, when properly applied, is a very realistic type of air conditioning. If the building loads are such that volume control will do the job, individual room control can be had at a cost equal to or below systems having only zone control. For example, one job was installed last year in a southern climate, which had over 100 electronically controlled high-velocity boxes, yet the entire air conditioning cost was only $754.00 per ton.

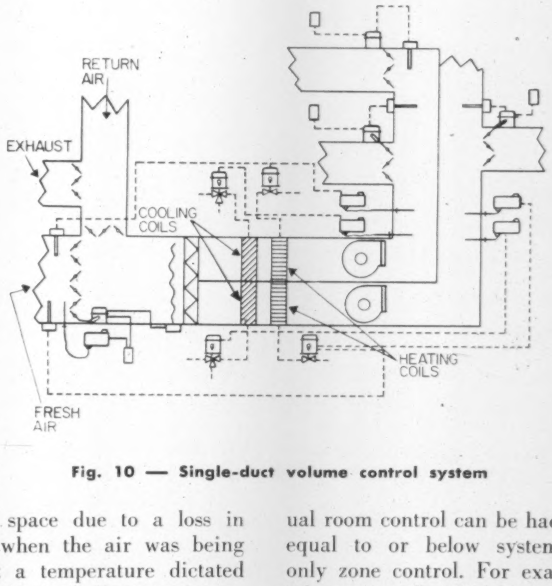


Fig. 10 — Single-duct volume control system

Control of High-Velocity Double-Duct Systems

By

H. W. Alyea

The author is Chief Field Engineer, Johnson Service Co., Milwaukee, Wis. The presentation was made at the Symposium on Air-Conditioning Instrumention at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Murray Bay, Que., Canada, June 24, 1957.

DOUBLE-DUCT systems having conventional, or what are now termed low, air velocities, have been used successfully for many years. In such systems 2 completely separate ducts from the central fan unit distribute air to the various conditioned spaces. One duct carries air which is warm with respect to that in the other. Space temperature is controlled by mixing the air, in required proportions, before it enters the space.

High-velocity systems are similar to the low-velocity variety except for the higher air velocities in the distribution system. The attendant higher friction losses cause the fan and duct systems to operate at a higher static pressure.

The central fan unit of a high-velocity double-duct system usually has conventional outdoor, recirculated and exhaust air connections with automatic dampers, a tempering coil in cold climate locations, a blower suitable for the pressure required in the system, a heating coil and a cooling and dehumidifying coil. Most systems employ a return air fan. A typical system is shown in Fig. 1.

The heating and cooling coils are on the discharge side of the fan. Air leaving these coils is delivered by the distribution system to the various double-duct units throughout the area served by the system where it is reduced in pressure, mixed in the proper proportions, and delivered to the space at conventional low velocity.

Because of the high velocity, certain precautions are necessary to prevent or reduce air noises. Careful arrangement and construction of ducts and the use of sound absorbing materials after the fan and in the mixing units are necessary.

These double-duct systems, properly designed and controlled, are capable of providing all requirements for complete, year-round air conditioning. They are especially adaptable to individual space temperature control and can supply up to 100 percent outdoor air for natural cooling.

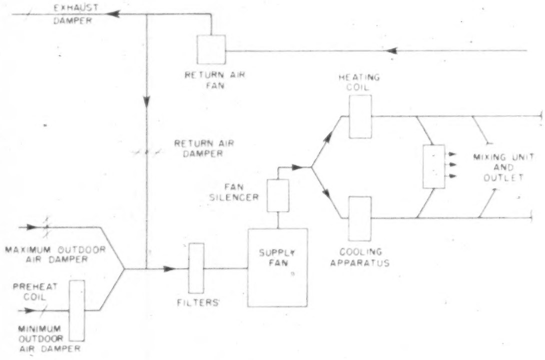


Fig. 1 — Schematic layout of a typical double-duct air-conditioning system

The foregoing description of the system is considerably abbreviated. Those interested in more detailed and complete information should refer to the many articles and reports on this subject. The purpose of this paper is primarily to discuss control of these systems.

Control of the Space Temperature

Each space served by the central system has one or more mixing units connected to the 2 distribution ducts. The function of these units is to reduce the velocity to normal values, provide sound absorption, and mix the air in the proportions required to maintain the desired space conditions.

These units may be under the windows along the periphery of the building discharging upward, or in the ceiling discharging through ceiling or sidewall diffusers. They are equally adaptable to exterior or interior zones of the building. Each unit is equipped with a double air valve arranged so that, as it reduces the flow of air into the unit from one of the ducts, it increases the flow from the other duct proportionately. This valving device is equipped with an automatic operator controlled by a thermostat responsive to space temperature.

Typical wall-mounted room thermostats normally are used to control these units. For the under-the-window type, however, it is not uncommon to have thermostats mounted inside the unit cabinet with the measuring element in the induced recirculated airstream. They are usually located adjacent to an access panel or are otherwise accessible so that the occupant can select the temperature setting.

The space control thermostats are not of the reversible type. Since the same duct is always cool with respect to the other one the action of the thermostat is the same regardless of whether the system is heating or cooling.

In large spaces, 2 or more under-the-window units may be controlled from a single thermostat. Where ceiling units are used for large spaces a single large mixing unit usually is employed discharging through low pressure ducts to several ceiling diffusers spaced to provide proper distribution.

There are as many different types of mixing valve arrangements as there are makes of units, but all have one common objective: they are designed to provide linear relationship between the position of the valve and the amount of air flowing through the valve at constant inlet pressure. Therefore, the total amount of air handled by the mixing unit is constant, provided the pressure remains constant, regardless of the valves' position. Air velocities are selected by design to provide the proper air movement and noise level and as long as the total air volume remains unchanged, air movement and noise will remain unchanged.

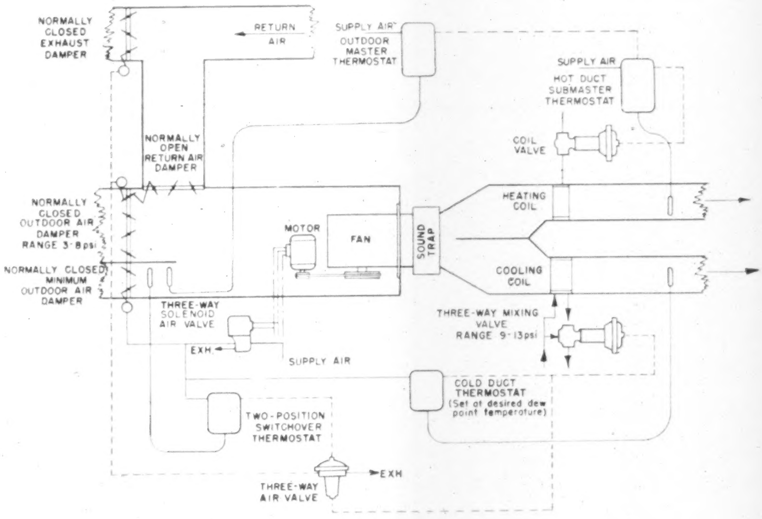

NORMALLY CLOSED EXHAUST DAMPER
RETURN AIR
SUPPLY AIR
OUTDOOR MASTER THERMOSTAT
SUPPLY AIR
HOT DUCT SUBMASTER THERMOSTAT
COIL VALVE
NORMALLY OPEN RETURN AIR DAMPER
NORMALLY CLOSED OUTDOOR AIR DAMPER RANGE 3-8psi
HEATING COIL
MOTOR
FAN
SOUND TRAP
NORMALLY CLOSED MINIMUM OUTDOOR AIR DAMPER
COOLING COIL
THREE-WAY SOLENOID AIR VALVE
THREE-WAY MIXING VALVE RANGE 9-13psi
EXH
SUPPLY AIR
COLD DUCT THERMOSTAT (Set at desired dew point temperature)
TWO-POSITION SWITCHOVER THERMOSTAT
EXH
THREE-WAY AIR VALVE

Fig. 2 — Temperature control for double-duct system

Control of the Central Unit

Because the functions of the central fan unit (Fig. 2) are much the same as in most other types of systems the control of these units offers nothing of special interest.

In most cases only a small portion of the total fan capacity is required for ventilation so when the fan is started a minimum outdoor air damper opens. If the climate and minimum outdoor air quantity are such as to result in an outdoor air and return air mixture temperature below about 55 F, a preheat coil should be employed.

In Fig. 2 a thermostat is shown controlling valves on the heating coil. This thermostat is reset by another thermostat measuring outdoor air temperature so that at times of maximum heat demand the warm duct temperature is highest, and is progressively lower as the outdoor temperature moderates. This arrangement makes it unnecessary for the warm air valves in the mixing units to modulate near their closed positions in mild weather. Better control of the mixing units and better pressure balance of the system are the results.

The cold duct temperature is controlled by a thermostat activating the preheat valve (if used); the outdoor air, recirculated air and exhaust dampers; and a valve on the cooling coil; all in sequence.

This thermostat is set to control at the desired indoor summer dew point but operates the year-round. This dew-point will be approximately 55 F.

During heating weather the warm duct is maintained at a value determined by the outdoor temperatures as described previously. The cold duct temperature is maintained at 55 F using the preheater if necessary or by taking in up to 100 percent outdoor air. When the outdoor air temperature is above 55 F, chilled water is made available at the cooling coil or the cold duct temperature is allowed to rise.

When outdoor air cannot handle the cooling requirements, mechanical cooling must be made available. This can be done automatically but usually is a manual operation since a competent operator is normally available.

When the outdoor air temperature has reached a point when it is no longer useful for cooling, another thermostat in the outdoor air intake closes the maximum outdoor and exhaust dampers and opens the recirculated air damper. For best economy this should be a wet-bulb thermostat, performing this function when the outdoor wet-bulb exceeds that of the return air. Because of the extra servicing required for a wet-bulb thermostat, however, this usually is a dry-bulb thermostat set for about 70 F.

When the outdoor temperature reaches a point where heat is no longer needed anywhere in the area served by the fan, the warm duct thermostat has been set down sufficiently so that the heating coil valve remains closed. The warm duct carries only the mixture of recirculated and outdoor air, while the cold duct remains at 55 F.

The cold duct temperature is not varied during the cooling season as was done for the warm duct temperature during heating operation. To do so would upset the dew-point and result in excessive humidity during mild cooling weather. At best only limited variation could be tolerated; thus it is deemed best to leave it at a fixed value.

Humidity Control

During summer operation and in localities where dehumidification is necessary, controlling the discharge from the cooling coil at the correct value will effectively control the space relative humidity. This is because in most buildings employing this type of system there is a negligible moisture gain or loss in the conditioned space. During this season a large portion of the air passes through the cooling coil. That which is distributed through the warm duct is not dehumidified but since the minimum outdoor air damper is closed during this period, this bypassed air is largely previously conditioned recirculated air.

To offset any moisture pick-up in the space, however, and because some of the outdoor air must by-pass the cooling coil except at times of maximum cooling load, the cold duct temperature is often set at a value 2 or 3 degrees below the actual desired space dew-point.

During heating operation the cold duct temperature does not represent the dew-point since the outdoor and return air mixture normally will not contain enough moisture. This results in a space humidity somewhat lower than that carried during cooling, which is what is normally desired. Furthermore, it provides progressively lower humidities as the weather becomes colder so that there is little danger of frosting windows.

For cases where winter humidity control is required, a humidifier can be added to the central fan unit. This can be located ahead of the fan if the mixed air temperature is high enough, or can be installed in the warm air duct downstream from the heating coil. Control of the humidifier is best accomplished by a humidistat in the common return.

In special cases where positive control of humidity in certain spaces such as hospital operating rooms is required, humidifiers have been installed in the discharge of some types of individual mixing units. This arrangement is usually satisfactory during heating operation. However, such rooms often require fairly high humidities and if they are on a system that also serves other types of rooms, moisture may have to be added during cooling. In such cases the discharge air probably will be too cold and condensation in the discharge duct and diffuser will result. The best solution to this is to place a humidifier in the room itself.

System Balance

Consider, for a moment, the case where all of the air is flowing through the warm duct, such as might occur at winter design conditions. The system has a certain resistance and, operating against such a resistance, the fan will have a certain air volume and static pressure. This situation can be represented by point A, Fig. 3(A), where the system resistance and fan pressure curves intersect.

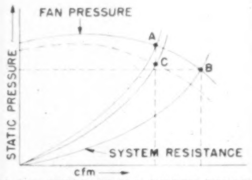
Fig. 3(B) shows how the static pressure decreases throughout the system as energy is gradually dissipated by friction. It is assumed that the velocity is constant throughout the system and while this will never be true in practice, it serves the purpose of this discussion and simplifies the diagram.

The pressure in the warm duct varies throughout its length and is different at each mixing unit. It will be assumed that these units are selected and adjusted to admit proper quantities of air at each location with an acceptable noise level and distribution pattern.

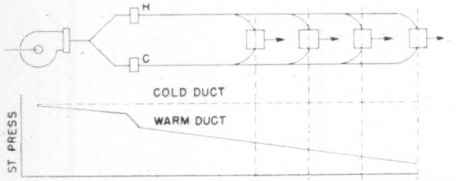
Since no air is flowing in the cold duct it has no pressure loss and the static pressure throughout its length is the same as at the fan. The condition shown in Fig. 3(B) is one extreme. The reverse of this condition exists when all of the air is flowing through the cold duct.

The other extreme condition exists when all of the mixing valves are in their mid-positions and half of the air flows through each duct. In this case the system resistance is much less than for the former condition and, operating against this lower resistance, the fan pressure decreases and the air volume increases. This is represented by point B, Fig. 3(A).

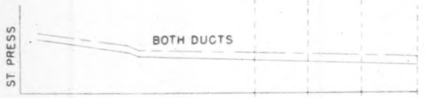
The solid line of Fig. 3(C) shows the static pressure drop throughout the system for this condition, both ducts having the same pressure at all points. With the increased fan volume the air volume and velocity at each mixing unit has increased, resulting in a higher noise level and a change in the distribution pattern.



(A) FAN PRESSURE AND SYSTEM RESISTANCE CURVES



(B) STATIC PRESSURE IN SYSTEM-ALL AIR THROUGH WARM DUCT



(C) STATIC PRESSURE IN SYSTEM-EQUAL QUANTITIES OF AIR THROUGH BOTH DUCTS

Fig. 3 — Fan and system characteristics

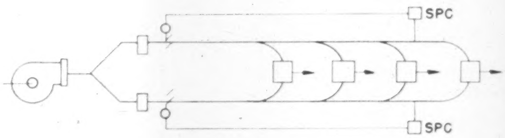


Fig. 4 — Static pressure control in each duct

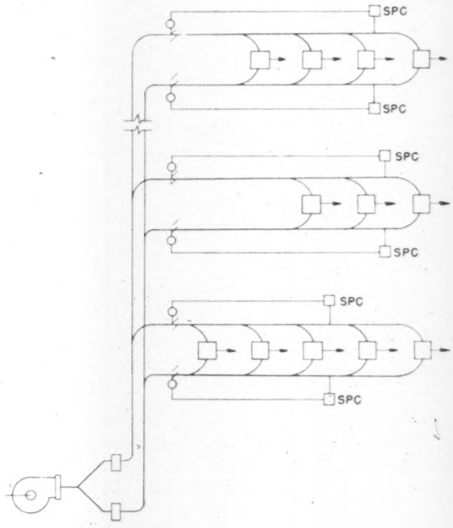


Fig. 5 — More elaborate system with static pressure control

While Fig. 3 shows the extremes that will be encountered in such a system, nevertheless the functioning of the mixing valves in the various units constantly shifts the flow of air from duct to duct resulting always in a condition falling somewhere between these limits. Not only does the total fan volume increase as the mixing valves tend to approach this mid-position, but, as will be seen by comparing Fig. 3(C) with Fig. 3(B), the increase in static pressure is greatest at the ends of the ducts. Thus most of the increased volume occurs at the units farthest from the fan. Were this increase uniform for all of the units it might be tolerable in some cases, at least. Actually, however, the system becomes excessively unbalanced at this extreme condition.

Another difficulty with this system is the excessive pressure throughout the cold duct, shown in Fig. 3(B) when all or most of the cold valves are closed. Any of the partially open cold valves have an excessive pressure drop resulting in high velocity and, usually, excessive noise. A similar situation exists in the warm-air duct when a majority of the warm-air valves are closed.

Controlling Fan Volume

One attempt to remedy the foregoing conditions is to control the cfm of air handled by the fan at a constant volume by use of a differential static pressure regulator connected to a pitot tube located at a suitable point in the fan inlet. The static pressure regulator operates fan inlet vanes, speed controls, or other means for varying fan capacity.

All this arrangement can do is prevent the rise in fan volume as the system resistance decreases. This is shown by point C of Fig. 3(A) where the broken line represents a new fan characteristic curve resulting from the operation of the control. With this control Fig. 3(B) would be the same as before. When the air flow is equally divided between both ducts, Fig. 3(C), the broken line represents the new pressure drop. The system is as much unbalanced pressure-wise as when there was no fan volume control.

Static Control in Ducts

The common method of maintaining reasonable pressure balance throughout the system is to provide static pressure control in the 2 supply ducts. The static pressure controllers should be located about two-thirds of the distance between the first take-off and the ends of the ducts. They operate automatic dampers at the inlets to the respective ducts usually located just downstream from the coils (Fig. 4).

With this control, one point in each duct is maintained at a constant static pressure. A unit located here would provide constant volume operation regardless of the position of its mixing valve or of the position of the mixing valves in any of the other units.

The pressure at other units would vary because there is a variable pressure difference between the location of the unit and the point of constant static pressure which depends on the amount of air flowing between these 2 points.

In many cases, especially where the units are grouped close together, sufficiently accurate pressure balance of the system can be obtained in this manner. This is especially true if the warm duct temperature, during heating, is varied in accordance with the outdoor temperature, since this has the very desirable effect of tending to keep the various unit mixing valves near their mid-positions. Unfortunately, the cold duct temperature cannot usually be varied in this manner, because of latent load consideration, unless a reheat coil is added in the cold duct.

This control method, in effect, changes the system characteristics by adding or removing resistance. When a majority of the valves are closed to one duct, most of the resistance in that duct occurs across the damper. The other damper would be approximately wide open. As the mixing valves tend to more nearly approach their mid-positions, the dampers at the duct entrances would approach their mid-positions. Thus, when half the air is being handled by each duct the dampers supply the additional system resistance needed to maintain the fan volume and its static pressure relatively constant.

In most cases the distribution system is considerably more complex than depicted in Fig. 4. Often a central fan will supply several floors by means of vertical risers with branch ducts at each floor, somewhat as shown in Fig. 5. To maintain satisfactory pressure balance of such a system it usually is necessary to employ static pressure controls for each major branch duct.

Because of the vast variety, size and complexity of distribution systems it usually is highly desirable to carefully analyze each system to determine just how many and in what locations static pressure controls should be applied. It is evident, however, that static pressure controls applied to the distribution system will, at best, be a compromise. The static pressure control can only maintain the pressure constant at one point in the duct. The more the distribution system can be divided into sections, each with separate static pressure control, the more nearly will the results approach the desired constant volume at each unit. Also, the more expensive it will be. For each installation, therefore, it is necessary to weigh the improvement that will result from dividing the system into smaller individually controlled sections against the added cost of doing this.

Individual Unit Flow Control

In controlling space temperatures some measure of control can be obtained by controlling by zones. Better control is accomplished if the zones are smaller, but the optimum control is achieved if each room is separately controlled. So, too, with pressure control of a double-duct system. Since the objective of such pressure control is to achieve constant volume output of all of the units, the desired approach, controlwise, is to provide such a control for each unit.

Recently, several such arrangements have been placed in successful use. While they are not justified, economically, in all cases, nevertheless on many systems with a number of major branch ducts the cost of providing adequate pressure control in the ducts is just as great as the cost of volume control on the individual units. In such cases the individual unit control is a better bargain. Even where the cost is greater they often will be justified on the basis of improved performance.

A number of methods of achieving constant volume output of the units are used. One involves a dampering device in the unit discharge actuated by the velocity pressure through a fixed opening or the pressure drop across a fixed resistance. In Fig. 6 a volume controller measuring the pressure difference across the outlet grille actuates a volume damper.

In Fig. 7 the warm and cold air valves are not linked together in the conventional fashion but are operated separately. The warm-air valve is controlled by the thermostat. The difference between the volume of air admitted by the warm-air valve and the desired fixed volume of delivered air is made up by the constant volume controller operating the cold air valve.

A third arrangement, Fig. 8, has the valves linked together and controlled by the thermostat in the normal manner so that as one valve opens the other closes by a like amount. The volume control is superimposed on these same valves in such a manner that it can close or open both valves simultaneously.

In addition to providing positive control of the air admitted by each of the mixing units in the entire system such constant volume controls can eliminate the costly and time-consuming job of manually balancing the system after it is installed. If each flow controller is adjusted for the correct air volume, this one adjustment should be all that is needed to assure correct distribution throughout the entire area served by the system. Furthermore, alterations and extensions of the system can be made without upsetting the system.

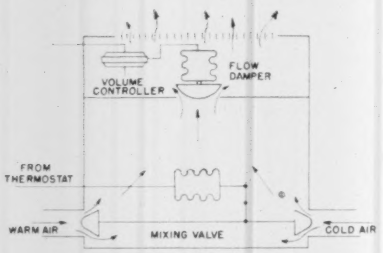


Fig. 6 — Constant volume control of unit—method one

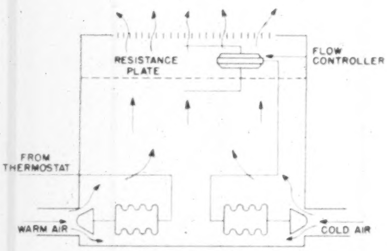


Fig. 7 — Constant volume control of unit—method two

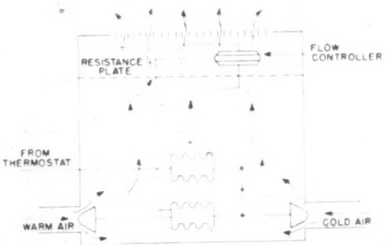


Fig. 8 — Constant volume control of unit—method three

Coordination of High-Velocity Design

By

L. F. Flagg

The author is Supervisor, Field Training, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The presentation was made at the Symposium on Air-Conditioning Instrumentation at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Murray Bay, Que., Canada, June 24, 1957.

WHAT does an owner buy when he invests in an air-conditioning system? He gets plans and specifications from the architect and engineer. From equipment manufacturers he gets such items as fans, coils, units, boilers, compressors, and controls. He gets labor and materials from the contractors. Even though the owner may want the best of all these things, it is more likely that his primary interest is in *results*.

To insure proper results from an air-conditioning system, all parts must be selected, installed, and adjusted with this common goal in mind. This requires good *design coordination*.

The desired end result has changed considerably over a period of time. In the early days of heating, it was almost a matter of *survival*. The first cooling systems featured signs such as 20 *deg cooler inside*. Controllability certainly was not important. Then came the era of *comfort* control as featured by the ASHVE Comfort Chart. Controls became a valuable accessory. As of today, the desired result seems to be more than comfort. Whether we are dealing with efficiency of office workers, factory personnel, or school children, it all adds up to the same thing: — good air conditioning pays for itself through *increased productivity*. This concept makes controllability a most important consideration in the design of a system.

Room Control vs. Zone Control

How extensive must the control system be to achieve the goal of maximum productivity? There is no question but what *individual room temperature control* produces the ultimate in results. In buildings where the load varies widely from room to room, there should be no compromise. Room control is the only way to get results. Thus it has become accepted practice for many types of buildings.

Another speaker at this symposium has already pointed out that the initial cost will be lower with a *zone control* system. Therefore, there is a great temptation to resort to this means of reducing the cost. Once this trend of thought is allowed to enter the picture, it is difficult to decide where to stop. Should one thermostat control 2, 4, or 8 rooms, one side of each floor, one side of the building, or the whole building?

In making a decision as to the proper zoning of a building, it is common practice to consider such factors as: (1) solar radiation, (2) wind velocity and direction, (3) stack effect, and (4) variations in building construction. These are all important, but do these factors truly represent the major load variations? In a modern building, lights and electrical equipment have become important load factors. Variations in occupancy and usage have and always will be big factors.

There is still another point to be considered. People do not all want the same temperature. Some work better in a cool room. Others like it warm. Some like to open the blinds or drapes. Others never do. Workers should have cooler rooms than those who have little or no physical exertion. Secretaries like it warmer than their bosses. These factors should all be taken into consideration when deciding the size of a zone for control. It may well be that such an analysis will indicate that individual room temperature control is warranted in order to achieve the desired results.

Basic Rate Control

In the past *basic rate control* has been thought of as control of the heating or cooling medium from outdoor temperature. Several examples of this have been pointed out by previous speakers. Some form of basic rate control is often desirable and sometimes necessary even when individual room temperature control is used. It is desirable because it results in more economical operation of the system. It is necessary when the room controls cannot function properly without it.

Here again, considering modern trends in building design, one may ask if outdoor temperature is still a meaningful indication of load. For some buildings, it may well be. For others, it is not. If not, how does one best establish the basic rate of heating or cooling supplied to the building? What many would like to do is average the demands of all the room thermostats. This is sometimes done on small jobs. The cost would certainly be prohibitive on large jobs.

Return air temperature is often suggested as representing average conditions. Unfortunately, this is frequently not true. In too many cases, the return air is subject to stray effects which cause false readings. Besides the basic philosophy behind individual room temperature control is to let each tenant set his own temperature level. How could a return-air controller be kept in step with the average of all the thermostat settings?

What seems to be needed is an actual Btu measurement. This is somewhat expensive but the results are certain. It could easily pay for itself on large jobs because of its value in checking overall efficiency as well as for good control.

In most cases it is likely that some form of flow measurement would be an economically acceptable means of establishing basic rate control. In a high-velocity air-conditioning system this could be simply a measurement of the main duct velocity. Thus basic rate control would be established on the basis that the main duct velocity varies as the average thermostat demand varies. This takes into account all load variations and should be considered when outdoor temperature is not a reasonable measure of load.

Static Pressure Control

Much has already been said about the need for some form of pressure control for high-velocity systems. This has turned out to be a very controversial subject. It also presents some of the most glaring examples of the need for careful *design coordination*.

For an example, let us further inspect the double-duct static pressure control system presented by one of the other speakers at this symposium. This involves automatic dampers at the inlets to the hot and cold ducts controlled by static pressure controllers for each duct. The objective of this control system is to supply the correct air flow to each room by maintaining reasonable pressure balance throughout the system. It sounds simple, but is it?

As the previous speaker pointed out, static pressure controls applied to the distribution system will, at best, be a compromise. Only one point in each duct is maintained at a constant static pressure. This is at the location of the static pressure measurement. The pressure at all other points will rise or fall with changes in flow in the duct. As the flow decreases, the pressure between the damper and the static tip will fall, but the pressure beyond the static tip will rise. Thus, the location of the static tip plays an important role in the end results.

Another important consideration is the size, type, and location of the automatic damper. It has a tough job to do because it must take more and more pressure drop as the air flow through it becomes less and less. It must add enough resistance under low flow conditions to absorb the change in static loss from the fan to the static tip location. This includes the change in pressure drop through the coil. It also includes a substantial change in the static to velocity pressure conversion at the transition leading to the high-velocity duct. Between 100 and 25 percent flow, all factors could easily add up to a change of 2½-in. water gage. Unless the damper is sized for more than ½-in. pressure drop in the wide open position, it would have to close to about 10 percent open to control properly at 25 percent flow. Obviously, any leakage around or through the damper will result in loss of control at low flow conditions, thus nullifying the advantages gained from its use.

The next consideration is the balancing of the job. If this is done with the static damper wide open and the room thermostats set to provide design flow in the cold duct, it will result in the highest available pressure at the first unit and the lowest pressure at the last unit. Now if the static damper and thermostats are put into control and if the average cooling load is less than design load, the first units will get less pressure. Thus, any of the first units which require full cooling cannot get the specified flow of air. Is this satisfactory or should the first units be balanced with the reduced available pressure, so they will be able to supply enough cold air at all times? Someone will have to make this decision.

A review of this example will disclose many important considerations for all parties concerned. The specifications should cover all factors clearly. No one should be allowed to make a change without regard to the others involved. *Design coordination* is a must.

Fan Speed Control

Fan speed control is seldom used on high-velocity applications because of the added expense. Yet, this may be like saying we should not insulate our houses because it costs money. Substantial reduction in operating horsepower could result from fan speed control.

On both single-duct variable volume and double-duct high-velocity systems, something is used to *kill* the excess static pressure under most operating conditions. Only at design load is the maximum pressure required. At all other times, dampers in the ducts or valves in constant volume units are partly closed to absorb the excess static pressure with no saving in fan horsepower. This means that the fan is using more horsepower than need be except at design load.

Since the fan normally operates at this high horsepower all year long, every effort is made to keep the design static pressure as low as possible. There is nothing wrong with this if it does not adversely affect the end result. Unfortunately, it sometimes does. Dampers are sometimes put in the low-velocity air stream so they will have a low pressure drop. Mixing units are often selected for very low pressure drops. With these low pressure drops, poor control may well result.

Fan speed control could thus result in 2 important advantages. It will provide substantial savings in operating costs. It permits the use of proper pressure drops for dampers and air valves without increasing the operating costs. A cost analysis should be made in the design stages of a job to see if the extra initial cost is a worthwhile investment.

Related Design Factors

There are many related factors which affect the controllability of an air-conditioning system. Time does not permit dwelling at length on these, but they are certainly worthy of mention.

The single-duct volume control system covered by another speaker at this symposium, has a good deal of merit as a *cooling only* system. When people enter a room, the additional cooling is provided by supplying additional air, which, in turn, provides better ventilation. When the same system is used for heating, however, it works in the wrong direction for ventilation. Thus, a crowded room means a smoke-filled room because of the reduced air. Such a system also lacks the flexibility of providing some rooms with cooling during the heating season. The general rule is that constant air volume with variable air temperature is always better than variable air volume.

There is no substitute for good air distribution. This means well-spaced diffusers, return grilles located to aid distribution, and proper air balancing of the system. Don't count on the thermostat to maintain equal temperatures throughout an area.

Exhaust dampers should be used and tied into the operation of the outdoor air dampers on most jobs. Don't count on exfiltration if a high percentage of outdoor air can be used at any time, whether by automatic controls or a manual switch. Failure to do this could result in a substantial reduction in air delivered to the rooms.

Avoid crowding the equipment. One must fight the modern trend to put the air-conditioning system in a broom closet. Coils too close to the fan outlet lead to wiping action and often result in getting hot air into the cold duct. Dampers too close to coils can create hot spots which frequently upset the control. Humidifiers too close to a duct turn or other object often result in water damage. Humidifiers should be placed downstream from a source of heat so the air will be capable of absorbing the required moisture.

Reheat should be used in areas where dehumidification in mild weather is a problem. For example, in double-duct systems it is frequently wise to put some heat into the hot duct until the cooling load is great enough to insure good dehumidification from the cooling alone. It is often wise to consider a separate small boiler for reheat because the owner may not be willing to run the big one in the summer.

Refrigeration equipment must not be allowed to short-cycle. If direct expansion is used, a control sequence should be established which will guarantee a minimum load greater than the minimum capacity of the machines. This is particularly critical on jobs where the air through the coil is reduced such as on double-duct systems. Consider using return air as a load. This is another good reason for keeping the hot duct warm in mild weather.

Stratification is a serious problem in control. There is no easy answer to it. Unfortunately, most outdoor air intakes seem to be located so as to guarantee stratification of outdoor and return air. Preheat coils are then used to protect against freeze-up, but they often introduce other problems. Two-position control of preheat too often causes overheating. Modulating control of preheat still creates stratification under light load and in cases of oversized coils may result in freezing the coil itself. In colder climates, 2 or more coils are frequently used to prevent oversizing. Preheat bypass dampers are effective in preventing freeze-up of the coil but again lead to stratification. Specially constructed mixing arrangements appear to be the only answer in some cases. Averaging thermostats do not eliminate stratification, but they should be used to provide good control if such a condition does exist.

Proper sizing of control valves has had so much emphasis from all control manufacturers that it needs no more than a reminder here. Let the control valve do a good job. An otherwise good job can give poor results if someone insists on oversizing the control valves. The control engineer and the consulting engineer should work together to see that a proper pressure drop is allowed and specified for the valve. Associated equipment such as coils and converters should be specified on the basis of the available pressure beyond the valve, taking the valve pressure drop into account. Valves with *equal percentage* characteristics should be specified whenever unusually good low flow control is required, when the allowable pressure drop must be low for any reason, and when proportioning the flow to a water coil. Two valves in parallel should be specified where large capacities are required but control at low capacity is still essential to good performance. It is good practice to use a PRV on steam jobs and a pressure-controlled bypass on water systems to prevent changing the heat output with no change in valve position.

These related design factors are important to all applicable systems. High-velocity systems are no exceptions. In spite of the many advantages of high-velocity systems, the basic concept of designing for controllability is still very important.

Conclusion

If the owner is to be provided with the kind of results he wants, it is necessary to take into account many or all of the factors presented here. But the rapid growth of the air-conditioning industry has made it very difficult for any one person to keep up with all phases of the work. *Design coordination* appears to be the real answer. Architects, engineers, equipment manufacturers, contractors, and building owners should all be working together like a well-coordinated team to get the *results* which all know are obtainable.

Make Plans Now for 64th Annual Meeting

Pittsburgh, Pa.—January 27-29, 1958

Noise Control Problems in Air-Conditioning Equipment

By

R. J. Wells

The author is Acoustics Engineer, General Electric Co., Schenectady, N.Y. The presentation was made at the Symposium on Sound and Vibration at the Semi-Annual Meeting of the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Murray Bay, Que., Canada, June 26, 1957.

PROBABLY the first step in a well-planned noise reduction program should be a careful consideration of the possible sources of noise in the equipment, and the various sound transmission paths by which the noise eventually reaches one's ear. These factors may be presented in the form of a block diagram. Fig. 1 shows such a diagram for an air conditioner which was studied by our laboratory.[1] The solid lines represent direct mechanical coupling; dotted lines indicate airborne sound. Thus, noise due to magnetic forces may originate in the motor which drives the blowers. This may be coupled through the frame and cause a vibration of the panels which act as the acoustic radiator. However, motor noise may also become air-borne at the motor itself — due to vibration of the motor stator frame — or even be air-borne within the motor — perhaps from a motor-cooling fan. For the machine under consideration, such noise would radiate freely through the air intake.

The 2 major sources of noise in this unit are the compressor and the blower-system. Compressor noise is radiated in much the same manner as motor noise. Blower noise is primarily aerodynamic noise and is radiated directly through the air exhaust. However, unbalance in a blower-system may produce excessive vibration which, in exceptional cases, may even cause the floors and walls of the building in which the machine is located to vibrate and radiate objectionable noise.

In general, noise reduction may be achieved either by decreasing the noise at its source or by cutting the path by which the noise eventually reaches the observer. This paper will discuss a few specific cases for both approaches.

Compressor Noise

In modern air-conditioning equipment, the compressor and its driving motor are sealed into a steel casing. See Fig. 2. The motor-compressor assembly is resiliently suspended in this casing. Hence, a minimum of forces of unbalance are transmitted from this assembly into the shell. The compressors are generally equipped with exhaust and intake mufflers — which can be assumed to be satisfactory. However, there still remains a major noise source, *viz.*, the compressor valves themselves. Valve noise is mechanical in nature, and may be minimized by proper design of the valves and valve springs. The valve noise possesses very strong harmonics — and one or more of the harmonics almost invariably has a frequency near that of one of the resonances of the cavity within the compressor housing. Hence, standing waves are set up inside the casing and are transmitted through the shell.

That such cavity resonance does occur can be demonstrated by operating a compressor with refrigerant-12, refrigerant-22, and air in succession. Each of these media possesses a different sound velocity, and the ratio of the measured frequencies corresponds to the ratio of these sound velocities.

Table 1 — Effect of 1/8-in. porous metal absorbers[1] backed by a 1/4-in. cavity on cavity resonance

Frequency	Long. Mode	Rad. Mode	Type of Porous Metal		
			Coarse	Medium	Fine
1100	1	00	8[a]	10[a]	15[a]
2200	2	00	18	20	24
2280	0	10	9	10	12
2520	1	10	10	8	13
3170	2	10	16	18	22
3300	3	00	23	26	26
3780	0	20	10	12	15
3940 4000	1 3	20 10	3	3	4
4370 4400	2 4	20 00	10	12	14
4750	0	01	—	—	—
4950 5000	4 3	10 20	13	14	17

[a] Figures are in decibels attenuation of resonant peak.

Cavity resonance may be controlled by introducing sound absorption into the cavity. However, commercial materials such as rock wool or glass fiber are impractical for this application. In an attempt to determine a suitable absorber, several grades of a porous metal, usually employed as a filter element in liquid or gas lines, were tested. These are

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[1] Exponent numerals refer to References.

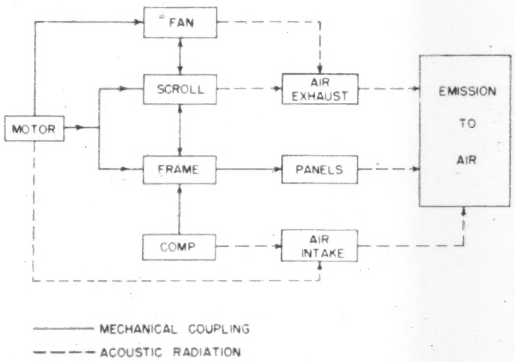

Fig. 1 *(above)* — Noise transmission paths in air-conditioning equipment. Solid lines represent mechanical coupling; dotted lines represent air-borne sound

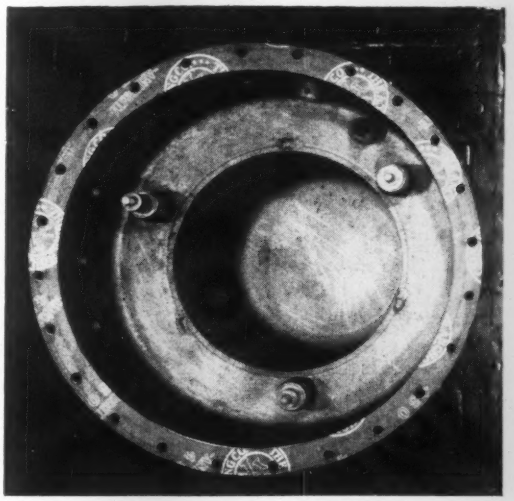

Fig. 2 *(right)* — Compressor housing for air conditioning. Cavity resonance may be excited in such housings by shock waves from compressor valves

shown in Fig. 3. The sound absorption coefficients for 3 grades of this material are shown in Fig. 4. Peak absorption occurs over a narrow band of frequencies but reaches values as high as 98 percent. The peak frequency is controlled by the absorber material and thickness, and the depth of the gas space behind it.

A small cylindrical enclosure, $3\frac{1}{2}$ in. in diameter by 6 in. long, was constructed to test the effect of absorption on cavity resonance. The cavity was excited at various frequencies by a speaker coupled through a high acoustic resistance. See Fig. 5. Sound pressure measurements were made with a high impedance condenser microphone placed flush with the inside end of the cylinder and located somewhat off axis.

All 3 grades of $\frac{1}{8}$-in. porous metal were checked using $3\frac{1}{2}$ in. diameter discs at one end of the enclosure. Cavity depths of $\frac{1}{4}$ in. and $\frac{1}{2}$ in. were used behind the porous metal.

Table 1 presents the test results, for the $\frac{1}{4}$-in. cavity case, in terms of the decibels reduction for the various resonant frequencies upon insertion of the absorber. The bare cylinder was tested using a washer-type spacer to preserve the cavity length. The theoretical resonant frequencies of the enclosure were calculated using the method indicated by Morse in his text *Vibration and Sound*. The agreement with the measured frequencies was excellent and allowed the identification of all resonant modes below about 5000 cps. These modes are denoted symbolically in Table 1 while Fig. 6 shows the radial pressure distribution for the various cases. The lowest frequency, 1100 cps, is thus simply a plane wave longitudinal mode where the cavity length is one-half wavelength. The second frequency, 2200 cps, is a similar case with the cavity length at one wavelength. The third resonance, 2280 cps, has a uniform longitudinal pressure distribution but a radial variation having a single diametrical node with pressure peaks elsewhere at the cylinder wall. The fourth resonance is a combination of the first and third — *i.e.*, the radial distribution is similar to the third mode, but there is also a longitudinal variation with pressure peaks at the cylinder ends and with a single pressure zero midway between. The only theoretical resonance below 5000 cps that was not excited was the 0, 01 mode — a purely radial pressure variation with a peak at the wall and a node at the center. The introduction of the absorber did not alter the resonant frequencies appreciably.

Inspection of Table 1 shows that, as might be expected, the greatest attenuation is obtained for longitudinal resonances where the pressure waves strike the absorber normally. However, appreciable attenuation is obtained for most of the higher modes as well. (Certain of these higher modes are grouped in the tabulation since it was impossible to separate them with the absorber in position). Table 2 shows similar results for the case of a $\frac{1}{2}$-in. cavity behind the absorber. The increased cavity depth results in a higher sound absorption coefficient, which in turn causes increased attenuation — particularly for the longitudinal mode.

These tests indicate that cavity resonance can be considerably reduced by the application of absorbing material.

Aerodynamic Noise from Blower System

Aerodynamic noise from the blower system is often objectionable in air-conditioning equipment. This is particularly true for room air-conditioners, and also for those central systems in which either the intake or exhaust ducts are rather short. Such noise may be broadly divided into a rotational component and a vortex component. The rotational component is associated with the impulse given to the air each time a blade passes a given point, and is hence a series of discrete tones at the fundamental blade-passing frequency and harmonics thereof. The vortex component is largely due to the shedding of vortices, or eddies, from the fan blades. It is random in character and has a continuous spectrum over a wide range of frequencies determined by the fan geometry and operation. Since the laws of generation of these 2 types of noise are different, the noise from different types of fans — such as propellor, centrifugal — will vary in character.[2]

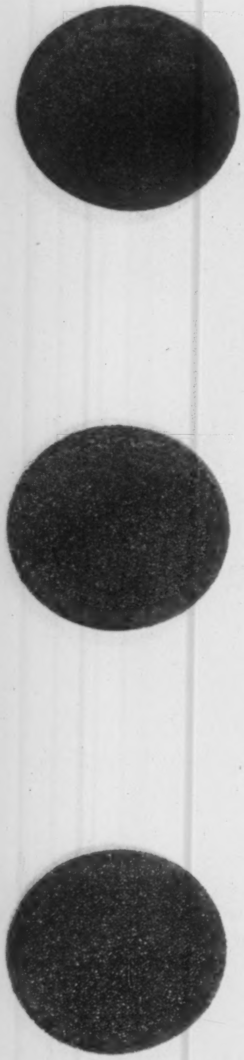

Fig. 3 — Samples of filter elements of porous metal tested for sound absorption properties. Materials of this kind may be used to reduce cavity resonance

Both propellor-type fans and centrifugal fans have been used in air-conditioning equipment. While the propellor fan may have certain advantages with regard to cost and design considerations, its noise is almost invariably of a more objectionable nature. This may be seen from Fig. 7 which shows the relative sound spectra for fans of both types. In general, the overall sound power will be about the same for a propellor fan as for a centrifugal fan, if both are designed to meet the same airflow requirements. This sound power level (re 10^{-13} watts) is given approximately by the empirical equation

$$P_w = 100 + 10 \log_{10} HP + 10 \log_{10} P \quad \ldots\ldots (1)$$

where

HP = the rated horsepower of the fan.
P = the pressure head, inches water[3].

However, the propellor fans have a sound spectrum which is almost flat, while the centrifugal fans produce far less noise in the high-frequency bands. Since high-frequency noise is more objectional to the ear than low-frequency noise, the centrifugal fan will seem to be quieter. In an attempt to put a number on this relative difference the method of Stevens has been used to compute the loudness in sones for the medium spectrum of each of the 2 ranges shown in Fig. 7 — under the assumption that the sound-power-level and the acoustical conditions were such as to produce an overall sound-pressure-level of 70 db in both cases.

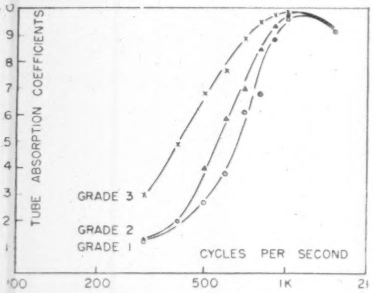

Fig. 4 — Impedance tube absorption coefficients for ⅛-in. porous metal samples in refrigerant-22 with 1-in. cavity

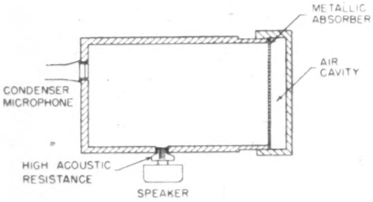

Fig. 5 — Cylindrical enclosure for studying cavity resonance reduction

Table 2 — Effect of ⅛-in. porous metal absorbers backed by a ½-in. cavity on cavity resonance

Frequency	Long. Mode	Rad. Mode	Type of Porous Metal		
			Coarse	Medium	Fine
1050	1	00	11[a]	16[a]	24+[a]
2100	2	00	25+	25+	25+
2280	0	10	7	10	12
2500	1	10	4	7	12
3100	2	10	20+	20+	20+
3150	3	00	35+	35+	35+
3780	0	20	7	11	13
3880 3930	3 1	10 20	4	5	7
4200 4320	4 2	00 20	10	13	14
4750	0	01	—	—	—
4780 4920	4 3	10 20	21	25	28

[a] Figures are in decibels attenuation of resonant peak.

The results were 15 sones for the propellor-type fan and 7.5 sones for the centrifugal fan — a loudness ratio of 2 to 1, or a 10 phon loudness level difference. This then, is roughly the acoustical penalty one must be prepared to pay for adopting a propellor-type fan to an air-conditioning system.

Noise Due to Unbalance in Blower System

Another source of blower noise is due to unbalance. This is more apt to be a source of difficulty for a centrifugal fan than for a propellor type. Fig. 8 shows an analysis of the noise of an air conditioner as measured on the second floor of a home with the air conditioner installed on the ground floor. The peak at 46-47 cps is the fourth harmonic of the blower wheel rotational speed. The excitation was simply a dynamic unbalance of the blower. This was amplified by resonances in the house structure and the result was objectionable — both as floor vibration and as air-borne sound. Various other harmonics of the blower speed were also discernable including the third, fifth, sixth, seventh, and eighth in particular. Poor blower wheel bearings may also give rise to similar vibrations.

In another instance, excessive house vibrations were caused by the variation in pitch diameter of a

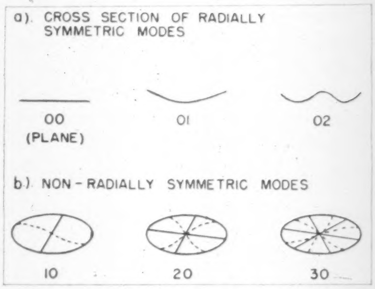
a). CROSS SECTION OF RADIALLY SYMMETRIC MODES
00
(PLANE)
01
02
b). NON-RADIALLY SYMMETRIC MODES
10
20
30

Fig. 6 — Radial pressure modes for cavity resonator tests

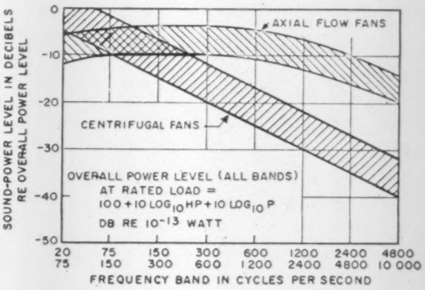

Fig. 7 (right) — Octave-band sound-power-levels relative to the overall sound-power-level for 2 types of fans operating near peak efficiency. Overall power level is determined from the equation on the graph, where HP is the rated horsepower of the fan and P is the pressure head across the fan

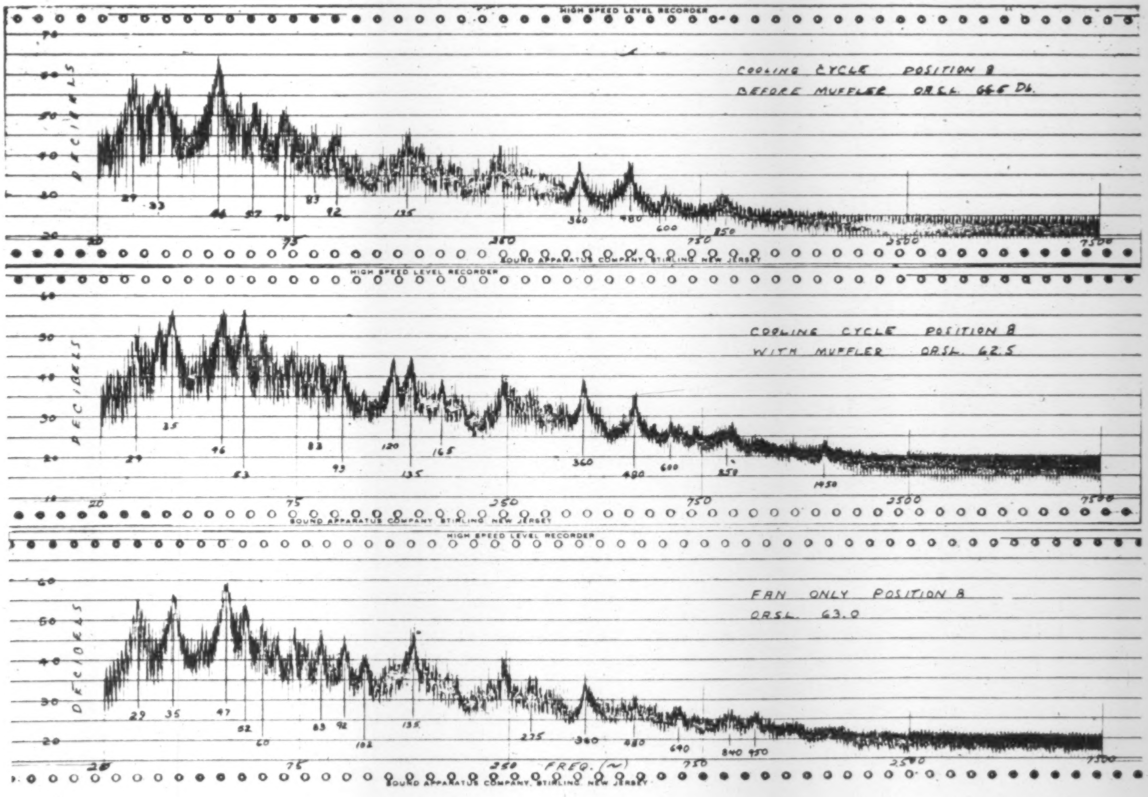

Fig. 8 — Sound analysis of air conditioner noise

variable speed pulley driving the blower.

The solution to such unbalance problems is obvious. Better bearings, pulleys, and adequate dynamic balancing equipment do exist. It is simply a matter of quality control.

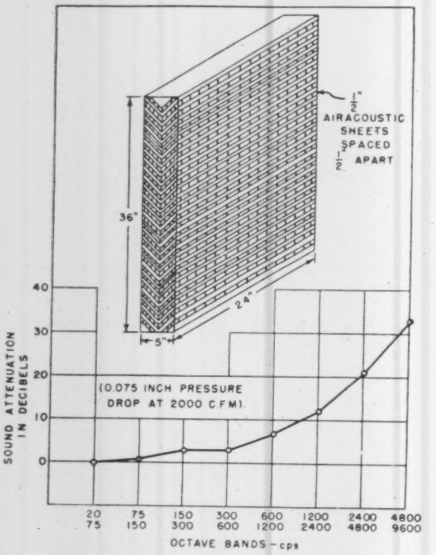

Fig. 9 — Short acoustic filter used experimentally on air conditioner indoor intake

Vibration isolation of the blower system is also often desirable, as discussed later.

Noise from Panel Vibration

Objectionable noise is often radiated from the various panels of the air-conditioning equipment. The panels are usually excited by mechanical coupling from the compressor and the blower system. An obvious solution is vibration isolation of such equipment from the frame. However, this is not always a simple procedure, especially in the audible frequency range. Inflated air pads generally furnish the best isolation, but are usually unsuitable for mechanical reasons.

In one machine, a blower wheel and its driving motor were separately mounted to the frame of the unit, the blower being driven by means of a belt. In an attempt to reduce objectionable vibration, separate tests were made with the motor vibration mounted, and with the blower vibration mounted. However, it was found that in either event the belt would effectively short circuit the vibration isolation. If both motor and blower were to be separately vibration mounted they could not be coupled together with a belt. The only solution was the construction of a composite blower-motor assembly which was vibration-isolated from the frame as a unit.

Even with all vibration sources as well isolated as practical, the noise radiated by the panels may still be objectionable. The solution then involves either bracing the panel — to change the natural frequency — or applying some form of damping material — such as a new spray-on material recently introduced in the U.S.A.

Exhaust and Intake Noise Control

Since fan noise is very difficult to control at the source, it is frequently necessary to provide sound treatment for intake and exhaust ductwork. The treatment required varies considerably from one installation to another, and is all too often left to the discretion of the installation contractor. The result is occasionally a noise complaint which could easily have been avoided during the installation, but which may be expensive to correct later.

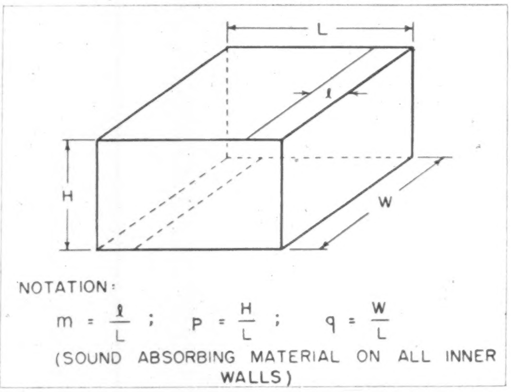
L
ℓ
H
W
NOTATION:
m = ℓ/L ; p = H/L ; q = W/L
(SOUND ABSORBING MATERIAL ON ALL INNER WALLS)

Fig. 10 — Single plenum chamber

Table 3 — Measured attenuation in decibels for single plenum chamber

($L = 33\ 7/16$ in., $W = 25$ in., $H = 12\ 1/4$ in.)
(½-in., *glass fiber duct liner*)

$m = \lambda/L$	Frequency Bands cps					
	375 750	750 1500	1500 3000	3000 6000	6000 12,000	12,000 24,000
0.151	14.7	15.3	17.7	23.0	21.3	19.5
0.227	16.5	16.6	17.9	18.7	14.6	15.0
0.302	15.7	12.9	11.9	14.7	13.7	14.8
0.378	10.8	10.8	10.2	11.2	10.7	12.4
0.453	10.0	11.0	9.4	10.4	10.0	10.8
0.529	8.5	10.6	7.7	10.8	10.8	11.4
0.604	7.3	9.8	6.9	10.7	10.5	10.5
0.680	6.6	9.3	6.4	10.2	9.8	10.4
0.726	6.6	9.4	5.4	9.1	10.2	10.0
0.831	5.6	7.4	4.7	7.5	8.9	7.8

Duct treatment may take various forms such as simple linings, splitters, egg crate treatment, lined bends and acoustic plenums, most of which are well-covered in the literature, and only 2 of them will be considered here.

In one field problem, the intake of a large air conditioner was directly off a doctor's waiting room, the machine being located in an adjacent enclosure. Only the thickness of a 5-in. wall separating the rooms was available for sound treatment. Fig. 9 shows the best acoustic filter we were able to design, and the test results[1].

Table 4 — Calculated attenuation from equation 2 for single plenum chamber

(L = 33 7/16 in., W = 25 in., H = 12 ¼ in.)
(½-in., *glass fiber duct liner*)

$m = \lambda/L$	Frequency Bands cps					
	375 750	750 1500	1500 3000	3000 6000	6000 12,000	12,000 24,000
0.151	7.3	9.0	12.4	16.2	18.9	17.3
0.227	6.2	7.7	10.8	14.2	16.7	15.1
0.302	5.5	6.8	9.6	12.6	14.6	13.4
0.378	5.0	6.1	8.6	11.1	12.7	11.8
0.453	4.5	5.5	7.6	9.7	11.0	10.3
0.529	4.0	4.8	6.6	8.3	9.2	8.7
0.604	3.4	4.1	5.4	6.7	7.4	7.1
0.680	3.0	3.2	4.2	5.2	5.7	5.4
0.726	2.2	2.6	3.5	4.3	4.6	4.4
0.831	0.9	0.9	1.7	2.2	2.5	2.3

The other treatment to be mentioned here is that of acoustic plenums.[4] Fig. 10 indicates the general approach. Basically, the attenuation is obtained by lining the plenum with a highly absorbent material. However, contrary to popular ideas, this attenuation is not determined solely by the area of the openings and the total plenum absorption. In general, considerably more attenuation is realized than one would expect on this basis, and the limitation is usually the direct sound transmission from plenum entrance to exit. Based on both experiment and ray acoustics theory, the following approximate expression has been derived for acoustic plenum attenuation.

$$\text{Attenuation in db} = 10 \log_{10} 1/[S[(\cos \phi/2\pi d^2) + (1 - \alpha/a)]] \quad \text{..........(2)}$$

where

a = total absorption within chamber, sabins.
S = plenum exit area, square feet.
d = diagonal distance from entrance to exit, feet.
α = absorption coefficient of lining material.
ϕ = angle between the diagonal, d, and the normal to the plenum openings.

For frequencies sufficiently high that the dimensions of the plenum exceed about one wavelength this formula will predict the sound attenuation within a few decibels. At low frequencies, somewhat more attenuation is realized than will be computed by the foregoing relation, due to the existence of a resonant muffler action in the duct-plenum system.

Table 5 — Measured attenuation minus room constant equation calculation in decibels for single plenum chamber

(L = 33 7/16 in., W = 25 in., H = 12 ¼ in.)
(½-in., *glass fiber duct liner*)

$m = \lambda/L$	Frequency Bands cps					
	375 750	750 1500	1500 3000	3000 6000	6000 12,000	12,000 24,000
0.151	7.4	6.3	5.3	6.8	2.4	2.2
0.227	10.3	8.9	7.1	4.5	−1.9	−0.1
0.302	10.2	6.1	2.3	2.1	−0.9	1.4
0.378	5.8	4.7	1.6	0.1	−2.0	0.6
0.453	5.5	5.5	1.8	0.7	−1.0	0.5
0.529	4.5	5.8	1.1	2.5	1.6	2.7
0.604	3.9	5.7	1.5	4.0	3.1	3.4
0.680	3.6	6.1	2.2	5.0	4.1	5.0
0.726	4.4	6.8	1.9	4.8	5.6	5.6
0.831	4.7	6.5	3.0	5.3	6.4	5.5

Table 3 is what might be considered as a scale model test of a series of plenums as the entrance and exit openings were varied. The dimensions and type of sound absorbing material used are listed. The factor m is the percentage open area at the plenum entrance and exit. The measured absorption coefficients of the lining material are shown in Fig. 10. Table 4 shows this same attenuation as computed from Equation 2, while Table 5 gives the differences between the measured and calculated values. The agreement is considered to be reasonably good in the upper right-hand region — where plenum dimensions exceeded one wavelength. At the bottom of the table, the lack of agreement is due to the high percentage open area. Here the concept of a plenum really disappears, for there are but short barriers projecting into a straight treated duct section.

For increased attenuation, several such plenums may be placed in series. This is the basis of one of the more effective methods of noise control that has been applied to jet engine test cells. However, the attenuations of successive plenums cannot be added directly. One must consider interaction between them. This matter is considered in some detail in Reference 4.

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January 27-29, 1958

Full Program and Busy Sessions at Murray Bay Meeting

Six technical sessions were included in the 3-day program with 2 symposia. With the concentrated program there was still time for some social features, including the annual golf tournament.

With the Manoir Richelieu at Murray Bay, Que., Canada, as the site, the 1957 Semi-Annual Meeting programmed a total of 6 sessions into three days. There were concurrent sessions each day, and committees met during the only otherwise unscheduled hours. The result was that the Meeting presented an exceedingly busy program. It also attracted an attendance of 412, made up of 222 members, 11 guests, 159 ladies, and 20 children. The weatherman was only mildly cooperative, but during the days when the weather was fine, the Murray Bay climate fully lived up to its notices and the beautiful setting of the hotel added greatly to the success of the meeting.

As is the case at all Society meetings, the success of the program was due in great part to the preparatory work of the Committee on Arrangements and also to the care with which the planned arrangements were carried out.

Heading the Committee on Arrangements of the Montreal Chapter was D. Lorne Lindsay, general chairman, and he was ably assisted by 4 vice chairmen, namely, W. G. Hole, B. J. Horsburgh, R. J. Ker and H. G. S. Murray. The honorary chairmen, F. Aylmer Hamlet and G. Lorne Wiggs were also active throughout the planning and throughout the meeting itself. Much of the actual work of planning the meeting was the result of the efforts, not only of the members of the various sub-groups of the Committee on Arrangements, but particularly of the chairmen of these groups as follows: *Reception and Registration* — G. Lorne Wiggs and C. D. Lynch; *Ladies* — Mrs. A. E. Horsburgh; *Children* — J. P. Fitzsimons; *Transportation and Hotel Reservations* — W. E. Jarvis; *Finance* — F. G. Phipps and Ralph Grossman; *Banquet* — Leo Garneau; *Entertainment* —G. N. Martin, W. G. McCrudden; *Golf* — W. J. McAdam; *Publicity* —W. U. Robinson; *Sessions* — Eric Williams, M. P. F. Turnau.

First Session, Monday, June 24, 2:00 p.m.

The session was opened in the Rose Room of the Manoir Richelieu by Pres. P. B. Gordon, New York, N.Y., who called on D. Lorne Lindsay, chairman of the Committee on Arrangements who extended the greetings of the Montreal Chapter as host and who also outlined the several features of the program.

President Gordon also announced that the Committee on Resolutions would be made up of C. S. Koehler, New York, N.Y.; G. A. Linskie, Dallas, Tex.; and H. G. Gragg, Chicago, Ill.

President Gordon then read the rules for technical sessions and presented S. F. Gilman, Syracuse, N.Y., who presented the paper Thermal Circuit Analysis for Developing Application Engineering Information, by S. F. Gilman and O. W. Clausen (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1957, p. 153).

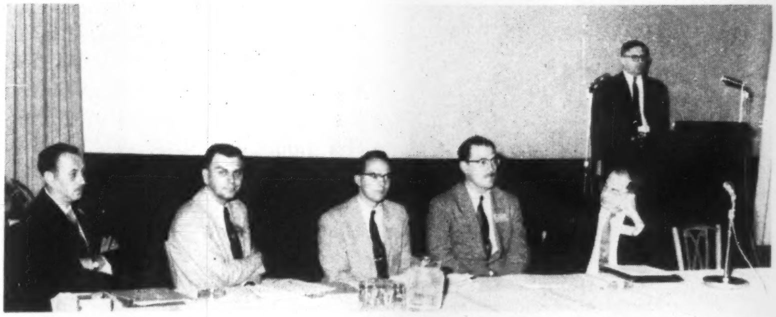
Following a discussion of this paper by Prof. Harry Buchberg, Los Angeles, Calif., President Gordon called attention to the proposed amendments to the Society By-Laws. He read the draft of these proposed amendments dated June 24, 1957, as approved by the Council on June 23, 1957. The proposed By-Law changes had to do with Article II, Sec. 3, Sec. 4, Sec. 5 and Sec. 6, as well as changes in Article VII, Sec. 2. President Gordon explained that under the By-Laws, it was necessary to present these proposed amendments in order that they might be voted on at the next Annual Meeting of the Society. No additional amendments to the By-Laws were proposed.

President Gordon then called on G. O. Handegord, Saskatoon, Sask., Canada, who presented the second paper of the session on Thermal Performance of Frame Walls, Part III — Wall Surface Temperatures, by G. O. Handegord (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1957, p. 145). M. W. Keyes, Pittsburgh, Pa., had prepared a written discussion of this paper, and it was discussed from the floor by L. E. Seeley, Westfield, Mass., and S. F. Gilman, Syracuse, N.Y.

The third paper on the program, Saturation Pressure of Water on the New Kelvin Temperature Scale, by J. A. Goff (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, July 1957, p. 151), was presented by title only and following this announcement, President Gordon adjourned the session.

Second Session, Monday, June 24, 2:00 p.m.

This session, held in the Casino at the Manoir Richelieu, was opened by 1st Vice Pres. E. R. Queer, University Park, Pa. This session had been organized as a Symposium on Air-Conditioning Instrumentation, with C. H. Pesterfield, East Lansing, Mich., as the symposium chairman. It had been expected that R. N.



Speakers at the Symposium session on Sound & Vibration (*l to r*): S. Baken, New York; R. N. Hamme, Ann Arbor; R. E. Parker, Chicago; H. C. Hardy, Chicago; R. J. Wells, Schenectady; and at the speakers stand, J. B. Graham, Buffalo

Pond, Rochester, N. Y., would act as moderator, but he found it impossible to attend. Professor Pesterfield, therefore, acted as moderator for the session.

The several speakers at this symposium session were members of the *Instrument Society of America* and that Society had cooperated with Professor Pesterfield in the planning and organization of the symposium. Professor Pesterfield acknowledged the gratitude of the Society at the excellent cooperation which had been received from the *Instrument Society of America.*

Four speakers had prepared papers for presentation as follows: I — *Fundamentals of Control* — V. Robert Baird, Skokie, Ill.; II — *Control of High-Velocity Single-Duct Systems* — W. G. Young, Rockford, Ill.; III — *Control of High-Velocity Double-Duct Systems* — H. W. Alyea, Milwaukee, Wis.; IV — *Coordination of High-Velocity Design* — L. F. Flagg, Minneapolis, Minn.

The moderator called on each of these speakers successively and following their presentations the session was thrown open for discussion.

Discussions were offered by C. D. Potter, Providence, R.I., J. W. Kreuttner, New York, N.Y., C. S. Woodruff, Baton Rouge, La., P. J. Marschall, North Chicago, Ill., and A. V. Harrington, Boston, Mass.

Moderator Pesterfield announced that, as usual with papers presented at the symposium sessions, it is not planned to publish the papers or the discussions in the TRANSACTIONS. However, it is expected that the papers either in full or abstract form will be published in the ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning.* Also publication of a symposium bulletin in which the several papers and discussions will be collected is under consideration and announcement concerning its availability will be made when a decision is reached.

At the conclusion of this announcement, 1st Vice President Queer closed the session at 4:30 p.m.

Third Session, Tuesday, June 25, 9:30 a.m.

This session had been organized as a topical session on Sound and Vibration. Following the opening of the session by 2nd Vice Pres. A. J. Hess, Los Angeles, Calif., he introduced H. A. Lockhart, Morton Grove, Ill., to act as chairman during the presentation of the papers.

A series of 4 papers, all bearing on the subject of sound and vibration, had been especially prepared for this session, and Chairman Lockhart called on C. M. Ashley, Syracuse, N.Y., who presented his paper, Criteria for Room Noise from Air Conditioning (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning,* July 1957, p. 145).

A written discussion had been prepared by R. A. Gonzalez, Dayton, Ohio, while J. B. Chaddock, Cambridge, Mass., John Everetts, Jr., Philadelphia, Pa., Lester T. Avery, Cleveland, Ohio, and H. E. Kinney, Detroit, Mich., discussed the paper from the floor, after which Mr. Ashley presented his closing remarks.

Chairman Lockhart then introduced W. F. Kerka, Cleveland, Ohio, who presented his paper, An Evaluation of Four Methods for Determining the Sound-Power Output of a Fan (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning,* April 1957, p. 139).

C. M. Ashley had prepared a written discussion, while R. C. Edwards, Pompton Plains, N.J., and R. L. Hull, East Moline, Ill., presented floor discussions. Mr. Kerka then closed the discussion period.

The next paper had been prepared by W. J. Burch, Annapolis, Md., on the subject Acoustic Power Level Determination for Machinery in Hard Rooms (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning,* June 1957, p. 161).

The lantern-slide screen is the focus of attention for (*l to r*): V. Robert Baird, Skokie, Ill.; W. G. Young, Rockford, Ill.; and Treasurer Pesterfield at the Air Conditioning Instrumentation Symposium

Mr. Burch was present in person to present his paper which was discussed by Mr. Kerka and Mr. Ashley, following which Mr. Burch closed the discussion period.

The final paper of the session had been prepared by H. H. Vickers and R. W. Sage, Linden, N.J., on the subject Studies in Silencing a Diesel Driven Heat Pump (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning,* May 1957, p. 163). Chairman Lockhart called on Mr. Sage to present the paper, and following this, a written discussion was heard from J. B. Chaddock, Cambridge, Mass. Mr. Sage then closed the discussion.

Journal Section

Chairman Lockhart turned the meeting back to 2nd Vice President Hess who closed the session at 11:45 a.m.

Fourth Session, Tuesday, June 25, 9:30 a.m.

The fourth session met in the Casino and was called to order by Treas. C. H. Pesterfield, East Lansing, Mich.

The first of the 4 papers programmed for the session was by C. F. Speich, W. R. Dennis and A. A. Putnam, Columbus, Ohio, on the subject Acoustic Coupling of Residential Furnaces with Their Surroundings (published in ASHAE Journal Section, *Piping & Air Conditioning*, February 1957, p. 251).

L. F. Flagg, Minneapolis, at the microphone at a symposium session

Meetings of Technical Advisory Committees always attract an interested attendance and provoke serious discussions

A written discussion had been prepared by W. W. Popyk, Johnstown, Pa., and a floor discussion was presented by W. T. Knox, Linden, N.J.

Professor Pesterfield announced that the second paper would be presented by its author, W. G. Colborne, Kingston, Ont., Canada, on the subject Performance of Intermittently-Fired Oil Furnaces (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, April 1957, p. 147).

Written discussions had been prepared by A. G. Reed and J. D. Barnes, Toronto, Ont., Canada. Discussions from the floor were presented by R. L. Weeks, Linden, N.J., J. I. Trimble, Columbus, Ohio, and Charles Barrows, Levittown, Pa.

Following their presentation, Professor Colborne closed the discussion period.

The third paper on the program for the session was Measurement of Infiltration in Two Residences, by D. R. Bahnfleth, T. D. Moseley and W. S. Harris (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, in two parts: Part I — Technique and Measured Infiltration, in June 1957, p. 165; Part II — Comparison of Variables Affecting Infiltration, in July 1957, p. 159).

In the absence of the authors, Chairman Pesterfield announced that the paper would be presented by C. M. Humphreys of the ASHAE Research Laboratory staff.

Written discussions were presented by T. C. Min, Cleveland, Ohio, and C. W. Coblentz, Washington, D.C.

Following the completion of the discussions, Mr. Humphreys presented his closing statements.

The last paper on the program for the session had been prepared by C. W. Coblentz and P. R. Achenbach, Washington, D.C., and was entitled Design and Performance of a Portable Infiltration Meter (published in ASHAE Journal Section, *Heating, Piping & Air Conditioning*, July 1957, p. 155).

Following the completion of this paper, Treasurer Pesterfield closed the session.

Fifth Session, Wednesday, June 26, 9:30 a.m.

This session, which was held in the Casino at the Manoir Richelieu, was opened by 1st Vice Pres. E. R. Queer. The session had been organized in the form of a Symposium on Sound and Vibration with John Everetts, Jr., as symposium chairman. J. B. Graham, Buffalo, N.Y., was present to act as moderator for the session for which 5 papers had been prepared.

These papers were as follows: I — *Noise Control Problems and Air-Conditioning Equipment* — R. J. Wells, Schenectady, N.Y.; II — *Techniques of Sound-Power-Level of Unitary Equipment* — R. N. Hamme, Ann Arbor, Mich.; III — *Sound Standards for Testing and Rating* — H. C. Hardy, Chicago, Ill.; IV — *Application of Standards to Equipment* — R. E. Parker, Chicago, Ill.; V — *A Method for Estimating Octave Band Level of Noise Generated by Air-Conditioning Systems* — F. B. Holgate and Sidney Baken, Brooklyn, N.Y.

In accordance with the usual procedure at symposium sessions, there was a discussion period following the presentation of the last paper, and during this period, W. F. Kerka and C. M. Ashley raised questions from the floor for the several speakers.

Moderator Graham announced that there are no plans for publishing these 5 papers in the Transactions, but that it is excepted that either the full text of the papers or abstracts will be published in an early issue of the ASHAE Journal Section, *Heating, Piping & Air*

Conditioning. He also announced that consideration is being given to the collection of the several papers into a special bulletin. If a bulletin is completed, announcement will be made concerning it.

Following the close of the discussion period, President Gordon took charge of the session and read the Report of the Nominating Committee. He then called on C. S. Koehler, New York, N.Y., chairman of the Resolutions Committee, who read the Report of that Committee.

Following adoption of the Report, there being no unfinished or new business to come before the meeting, President Gordon adjourned the meeting.

President and Mrs. Gordon; he with his Scotch walking stick presented at the Habitant Party

Sixth Session, Wednesday, June 26, 9:30 a.m.

This session took place in the Rose Room at the Manoir Richelieu and was opened by Pres. P. B. Gordon, New York, N.Y. He successively called for the presentation of the 3 papers which had been programmed for the session. These 3 papers were as follows: Performance Testing of Roof Ventilators, by J. J. Wannenburg (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, March 1957, p. 147); Jet Velocities from Radial Flow Outlets, by Alfred Koestel (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, March 1957, p. 139); Velocities and Temperatures on Axis of Downward Heated Jet from 4-Inch Long-Radius *ASME* Nozzle, by Rudiger Knaak (published in ASHAE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, May 1957, p. 137).

In the absence of Mr. Wannenburg, his paper was presented by R. G. Huebscher, Cleveland, Ohio, of the Laboratory staff, and written discussions had been prepared by R. L. Stone, Belmont, Calif., and E. W. Conover, Detroit, Mich.

Professor Koestel was present in person to present his paper, and written discussions of it were prepared by D. J. Ingalls and S. F. Gilman, Syracuse, N.Y., and W. O. Huebner, New York, N.Y.

In the absence of Dr. Knaak, Prof. Linn Helander, Manhattan, Kans., presented the 3rd paper on the program, and written discussions had been prepared by H. B. Nottage, Encino, Calif., and W. O. Huebner.

Following the presentation and discussion of these 3 papers, President Gordon announced that the remaining items on the program consisted of the Report of the Resolutions Committee, any unfinished business and any new business and these would be taken up in the fifth session, which was running concurrently in the Casino. He urged that all interested go to the Casino to take part in this part of the meeting. President Gordon then closed the sixth session.

Social and Special Events

Before the formal sessions started, there were committee meetings on Saturday and Sunday. Socially there was dancing at the Casino in the Hotel on Saturday evening and a motion picture was also shown there on Sunday evening.

Seated at the center section of the head table at the Banquet, (l to r) 1st Vice Pres. E. R. Queer, Mrs. P. B. Gordon, D. L. Thomson, F. Aylmer Hamlet, Pres. P. B. Gordon, Mrs. D. J. McIntyre, Past Pres. John W. James, Mrs. W. G. Hole, 2nd Vice Pres. A. J. Hess

The social events really began with a Welcome Tea at the Hotel on Sunday afternoon, while the events for the ladies on Monday included a Putting Contest in the morning and a Fashion Show and Tea in the afternoon.

On Monday evening, the Montreal Chapter had arranged for a Habitant Evening with dancing at the Casino, and during the course of this, President Gordon was presented with a Scotch walking stick.

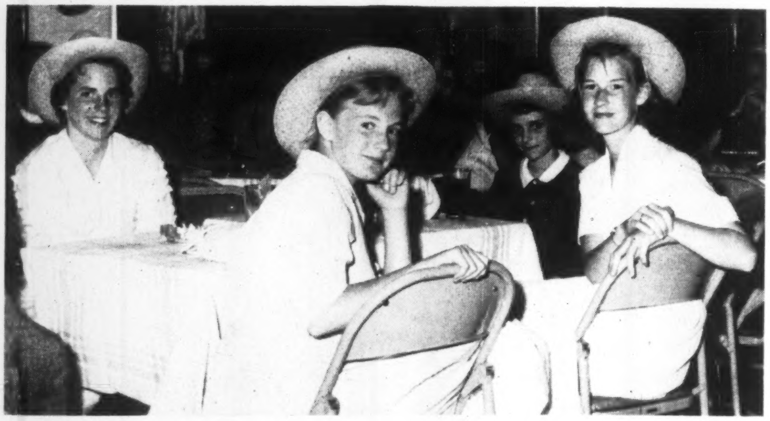
The Ladies Sightseeing Tour on Tuesday morning attracted practically everyone in attendance. The program for the ladies was rounded out by a Handicraft Exhibition at the Hotel on Tuesday afternoon and Wednesday morning.

On Tuesday afternoon, a bad break in the weather did not keep 66 enthusiastic golfers from taking part in the tournament.

As a result of the play, the Eichberg Memorial Trophy was won by the Montreal Chapter team made up of W. C. Isaac, J. L. Knight and G. Micks. And low gross score was reported by Arthur Nutting, Louisville, Ky. The ASHAE Past Presidents Research Bowl for the low net score in the tournament was won by W. C. Isaac of the Montreal Chapter. The Paul Bunyan Cup ended up in the possession of J. M. Kane, Louisville, Ky., who reported the high gross score.

The Semi-Annual Banquet which followed a reception given by the Montreal host chapter was held on Tuesday evening and was presided over by F. Aylmer Hamlet as toastmaster. President Gordon turned over to Past Pres. John W. James, Chicago, Ill., the Past President's Memory Book, following which Past Pres. M. F. Blankin, Philadelphia, Pa., and H. S. Wheller, Linden, N.J., presented the several golf trophies.

G. Lorne Wiggs was called upon to introduce the speaker, David L. Thomson, dean of faculty of graduate studies and vice principal, McGill University, Montreal, Que., Canada, who spoke on the subject *Welcome to Canada.* The banquet was followed by dancing.



Children attending the meeting were much in evidence during the Habitant Party

JENNINGS BECOMES SOCIETY RESEARCH DIRECTOR

Prof. Burgess H. Jennings is announced by Pres. P. B. Gordon as Director of Research for ASHAE. Professor Jennings was appointed by the Council and enters on his new duties about the middle of August. Following are highlights of his professional career.

To accept his new position as Director of Research for the AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, Professor Jennings resigned his appointment as chairman of the department of mechanical engineering, the Technological Institute, Northwestern University, Evanston, Ill. This post he has occupied since 1942. Prior to this, Professor Jennings had been actively engaged in the teaching profession since 1926, when he joined the staff of Lehigh University and where he remained until 1940. While at Lehigh, he attained the rank of associate professor and served as director of the Mechanical Engineering Laboratories. In 1940, he was appointed professor of mechanical engineering at Northwestern.

Burgess H. Jennings
ASHAE Director of Research

Professor Jennings holds the degree of Bachelor of Engineering from Johns Hopkins University in 1925, and from Lehigh University the M.S. in 1928, and the M. A. in 1935.

Active as Consultant

From early in his professional career, Professor Jennings has been an active consultant. Among his major clients are included; Philadelphia and Reading Coal and Iron Co., Pottsville, Pa., 1934-38; Frigidaire Division, General Motors Corp., Dayton, Ohio, 1943-45; Office of Scientific Research and Development, Research on Ventilation Control in Military Groups, 1943-46; Dole Refrigerating Company, 1946-47, 1955-57; Argonne National Laboratory, 1947-49; Office of Naval Research, Axial Compressor Research (Chief Responsible Investigator), 1947-49; Snow, Ice and Permafrost Laboratory, 1955; Rock Island Arsenal, 1955-57.

Research Interests

Professor Jennings has always been actively engaged in research work and has pursued his interests in the fields of thermodynamics, psychrometry, human engineering, fluid flow, gas turbines and compressors, ventilation and air conditioning, and atomic energy.

Research Publications

As a result of his research interests and activities, Professor Jennings is the author of some 25 research papers and articles, a few of which are: Tables of the Properties of Aqua-Ammonia Solutions, with F. P. Shannon, *Refrigerating Engineering,* May 1938; Water Injection in Axial Flow Compressors, with I. T. Wetzel, Midwest Power Conference, April 1949; Triethylene Glycol Vapor Distribution for Air Sterilization, ASHVE TRANSACTIONS, 1947;

Parameters Controlling the Measurement of Humidity in Air at Sub-Freezing Temperatures, International Applied Mechanics Conference, Istanbul, Turkey, 1952; Psychrometric Properties and Charts of Moist Air at Varying Pressures, *Refrigerating Engineering*, June 1954.

He continues to be actively interested in research and has several papers currently in preparation.

Author and Editor

Professor Jennings is also well known as author and co-author of a number of engineering textbooks, including the following: *Heating and Air Conditioning*, International Textbook Co., 1956; *Hazardous Vapors and Dusts in Industry*, Ventilating and Air Conditioning Contractors Association, 1957; *Steam and Gas Engineering*, D. Van Nostrand Co., Inc., in 4th Edition, 1947; *Air Conditioning and Refrigeration*, International Textbook Co., in 3rd Edition, 1950; *Internal Combustion Engines*, International Textbook Co., 1944; *Gas Turbine Analysis and Practice*, McGraw-Hill Book Co., Inc., 1952.

He has also found time to devote to editorial activities in connection with the preparation of books and periodicals in his professional field. He prepared the refrigeration section for the well-known *Kent Handbook*. He was also editor-in-chief of the *ASRE Data Book* for the 1949 and 1951 editions. He was founder and editor of the magazine *Lubrication Engineering* during the period 1944-50.

Active in Society Work

Professor Jennings has also been active in the work of the technical societies related to his fields of interest. This is shown by his not only having served in various offices of the *ASRE* and on a number of its committees, but he is also a past president of *ASRE*.

His record in connection with activities of ASHAE is also impressive. He served on the Guide Publication Committee during 1947-48 and 1950-51, and was chairman of that Committee in 1952. Other committee work in the Society included the TAC on Air Sterilization and Odor Control, 1945-46; TAC on Air Sterilization, 1947-49; Committee on Research, 1952, vice chairman in 1953-54, chairman in 1955-56; TAC on Heating Load, 1952; and the Research Long-Range Planning Committee, chairman from 1953-54.

Professor Jennings is a member of Tau Beta Pi, Pi Tau Sigma, and Sigma Xi. He was honored as recipient of the Richards Memorial Award of Pi Tau Sigma, awarded in 1950 *To the most outstanding Mechanical Engineer within 25 years after graduation*.

He is listed in *Who's Who in America*, *Who's Who in Engineering*, *Who's Who in the Midwest*, and *American Men of Science*, and is a registered professional engineer in the states of Illinois and Pennsylvania.

Professor Jennings thus comes to the Society staff with a long research, publication and administrative record and will direct the operations of the Society's research program both at the Cleveland Laboratory and at the cooperating institutions.

REGION 3 MEETS IN KANSAS CITY

The regularly scheduled spring meeting of the Chapters Regional Committee for Region 3 was held at the President Hotel, Kansas City, Mo., on May 13.

The opening session in the morning was presided over by A. B. Algren, regional director, who called on R. M. Spencer, Kansas City Chapter, who made those attending the meeting welcome. F. P Manchester, Omaha, Neb., was elected to act as secretary of the meeting. A role call indicated that all chapters were represented by the following members and alternates: S. C. McCann, member, and J. C. Fasnacht, alternate member, Kansas City Chapter; T. L. Roberts, member, Kansas Chapter; R. S. Stover, member, and W. A. Schworm, alternate member, (W. A. Schworm absent, D. E. Schroeder attended in his place) Iowa Chapter; R. L. Graham, member, and W. W. Dodge, alternate member, Illinois-Iowa Chapter; N. J. Hubbuch, member, and W. P. Norris, alternate member, St. Louis Chapter; E. T. Erickson, member, and Fred Vogt, alternate member, Minnesota Chapter; A. S. Widdowfield, member, Rocky Mountain Chapter; M. F. Stober, member, and F. P. Manchester, alternate, Nebr. Chapter.

NEBRASKA
IOWA
MINNESOTA

Society Officers and members meet in Kansas City for meeting of Region 3

Also present at the meeting were Pres. P. B. Gordon, New York, N.Y.; 1st Vice Pres. E. R. Queer, University Park, Pa.; and 2nd Vice Pres. A. J. Hess, Los Angeles, Calif.

The morning session was occupied by consideration of the points on the 1956 and 1957 Chapters Agenda. This session was recessed for luncheon, and during the luncheon 1st Vice President Queer spoke on *What Are Our Future Energy Sources.*

At the afternoon session, consideration turned to a discussion of chapter affairs, and then during an executive session of the committee, a member and two alternates were elected to membership on the Nominating Committee. Those elected were: Fred Janssen, Denver, Colo., member; D. M. Allen, Kansas City, Mo., 1st alternate; and G. W. F. Myers, St. Louis, Mo., 2nd alternate.

In the evening, the members of the Chapters Regional Committee and their guests were present at the regular monthly meeting of the Kansas City Chapter at which S. C. McCann was installed as the new chapter president.

Following the chapter dinner, President Gordon spoke on *Our Bottleneck — Technical Know-how.*

REPORT FROM THE STANDARDS COMMITTEE

The Standards Committee has many projects in progress, a number of which are of a continuing nature. Listed here is the substance of a report of the committee to the Council by K. T. Davis, chairman. Many of the current activities of the committee are mentioned and summarized.

Standard for Comfort Air Conditioning: Publication took place in the July issue of the ASHAE Journal Section with a statement that comments may be submitted for 60 days.

Proposed ASRE-ASHAE Standard Methods of Testing and Rating Forced-Circulation Air-Heating and Air-Cooling Coils: The 60-day period for comment following publication of a notice in the ASHAE Journal Section has expired. *ASRE* has been notified that no comments were received and that the final draft should now be prepared and submitted to the ASHAE Standards Committee which will make a recommendation to the Council regarding adoption as a Society standard.

Standard Test Code for Air Moving Devices: The following Society members have accepted appointment on a committee to review the code presented by *AMCA*: S. Konzo, chairman, L. G. Seigel, G. L. Tuve and D. D. Wile, and are now engaged in this review.

Joint Committee on Standard for Testing and Rating Equipment with Respect *to Noise*: Standards Committee has appointed C. M. Ashley, R. D. Madison and A. F. Hubbard as ASHAE representatives. *ASRE* has appointed Fred Urban, who will be chairman, and S. P. Soling. One additional *ASRE* representative will be appointed promptly to complete the committee and the first meeting called to determine whether other organizations should be invited to participate and whether the project should be separated into a number of subdivisions.

ASHAE Standard Code for Testing and Rating Return-Line Low-Vacuum Heating Pumps: Some editorial and other changes have been suggested to the committee after examination of the committee's draft of the code. It is expected that agreement regarding changes will be completed almost at once so that the final draft can be prepared for Standards Committee consideration.

ASHAE Standards Advisory Committee on Assistance to Local Groups Preparing Codes: This committee, with H. G. Strong as chairman, has been waiting for a just completed RISAC document, Information for Use When Considering a Municipal or State Safety Code for Air Conditioning and Refrigeration. From examination of the document it is evident that it does not contain enough specific information of the type required. The committee is planning to meet soon.

ASA Sectional Committee S-1 on Acoustics: *ASA* has disbanded *ASA* Sectional Committee Z 24 on Acoustics and replaced it by three committees: S-1 Acoustics; S-2 Mechanical Shock and Vibration; and S-3 Bio-acoustics.

R. D. Madison and Paul D. Close have been appointed representative and alternate, respectively, on Committee S-1.

ASA Sectional Committees Y-1 Abbreviations, and Y-10 Letter Symbols: R. W. Roose has been appointed Society representative.

ASA Sectional Committee Y-32 on Graphical Symbols and Designations: E. H. Munier has been appointed Society representative.

Proposed Method for Testing Sorption-Type Dehumidifiers: The members of the TAC on Sorption were appointed a committee to prepare this standard. Chairman G. L. Simpson expects to complete the final draft of the standard immediately after the TAC meeting being held on June 24.

ASA Sectional Committee A 114 Application Standards for Thermal Insulating Materials: A conference has been held to select names of organizations that should be invited to participate. ASHAE is sponsor for this project, with M. W. Keyes, chairman.

Operational Guide of Standards Committee: A number of changes are being considered by the Standards Committee for the purpose of clarifying procedure for handling requests for endorsement of codes and speeding up approval.

W. T. MILLER AWARD FOR 1957

Gordon T. Vail, Jr., Indianapolis, Ind., second from left, Purdue Student Branch, is holding the award plaque to which his name has been added for the year 1957. Mr. Vail also received a library of some 15 books in the field of air conditioning. Third from the left is Prof. W. T. Miller for whom the award is named. At the right is Robert F. Jackson, Lafayette, Ind., while at the left is John T. Evans, Toledo, Ohio, both of whom received honorable mention together with a collection of books valued at approximately $100. Members of the Indiana Chapter Award Committee were: W. F. Currise, chairman; S. E. Fenstermaker, Jr., F. E. Phelps, Prof. F. B. Morse

Air Pollution Group Holds Golden Jubilee

Celebrating its 50th anniversary, the *Air Pollution Control Association* held its meeting June 2-6 at the Hotel Sheraton-Jefferson, St. Louis, Mo.

In view of the meeting marking a 50th anniversary, the program was a full one covering 14 sessions with special emphasis on reviews and summaries of what has taken place in various air pollution activities during the 50 years that the Association has been in existence.

Members of ASHAE were prominent in many parts of the program and Benjamin Linsky, San Francisco, Calif., member of the Society, who is also president of the *Air Pollution Control Association*, spoke on the opening day on the subject *Fifty Years Backward and Forward in Air Pollution Control*. The meeting attracted much attention among people interested in air pollution, since some 50 technical papers were presented.

In addition to those sessions which were organized and sponsored by the Association, various sessions were organized and co-sponsored by other organizations interested in air pollution. These co-sponsoring organizations were ASHAE, *AIChE*, *American Meteorological Society*, and *ASME*.

Our Society sponsored the opening session of the meeting on Monday morning, June 3, in the Sheraton-Jefferson Hotel, and Bruce L. Evans, St. Louis, Mo., presided as chairman. This session attracted an attendance of nearly 200, and 5 papers which had been arranged by the Society were presented. These papers were as follows: An Evaluation of Environmental Odors, by W. F. Kerka and E. R. Kaiser; Public Nuisance Problems from Invisible Stack Effluents, by J. M. Kane; Procedures for Making an Inventory of Air Pollution Sources, by A. T. Rossano, Jr., and N. E. Schell; Plant Damage Due to Air Pollution and Use of Plants as Indicators of Air Pollution, by F. W. Went; and ASHAE Air-Borne Dust Survey, by K. T. Whitby, A. B. Algren, R. C. Jordan and J. C. Annis.

Many members of the Society took part in the meeting in addition to those who prepared the papers, with such diverse assignments as acting as chairman of sessions, as authors of papers, as officers and directors of the Association, and assisting and arranging the program through membership in the local arrangements committee.

DEGREE FOR MISS INGELS

At the recent commencement at the University of Kentucky, the honorary degree of Doctor of Letters was conferred on Miss Margaret Ingels, a member of the Society over a long period.

Miss Ingels is an alumna of the University having received a B.S. and an M.E. degree, and is associated with Carrier Corporation but makes her home in Lexington, Ky. Prior to assuming her present association, she held a position with the Chicago Telephone Co. Also she was a member of the staff of the Research Laboratory of the Society at the Bureau of Mines in Pittsburgh.

She is the author of many articles in the Society's JOURNAL and in the TRANSACTIONS.

During her association with the Laboratory, she was also secretary of the Pittsburgh Chapter. Miss Ingels is also well known for her work in the air conditioning of homes and also as the author of a biography of Dr. Willis H. Carrier.

BUENGER CONSULTANT WITH ARCHITECT FIRM

Albert Buenger, Cincinnati, Ohio, a long-time member of the Society who was a member of the Council 1934-37, has joined the architectural firm of Cordes, Pressler, Houck and Assocs. in Cincinnati as an associate consulting engineer.

For some years Mr. Buenger has been associated as chief supervising engineer with the Sheraton Hotels Corp., Boston, Mass.

53rd ANNUAL ASRE MEETING

Featured by 13 technical papers, the three-day 53rd Annual Meeting of the *ASRE* was held June 3-5, 1957 at the Hotel Fontainebleau, Miami Beach, Fla. Members of ASHAE took an active part in the program, and included among the authors of technical papers were Merl Baker, Lexington, Ky.; C. F. Kayan, New York, N.Y.; O. J. Nussbaum, Trenton, N.J.; and E. P. Palmatier, Syracuse, N.Y.

During the course of the meeting several conferences were held including one on air conditioning, and members of the Society taking part in this portion of the program included R. L. Boyd, Jr., Rochester, N.Y.; G. R. Munger, Toledo, Ohio; and P. W. Wyckoff, Dayton, Ohio, while J. D. Bopp, Marinette, Wis., was included among the speakers at a contaminants conference. The meeting also programmed several forums.

Among the new officers and directors were several members of the Society, including Cecil Boling, West Hartford, Conn.; R. A. Gonzalez, Dayton, Ohio; G. K. Iwashita, Bloomfield, N.J.; and D. D. Wile, Los Angeles, Calif.

SHARP ON COUNCIL OF ST. LOUIS SOCIETIES

H. C. Sharp, St. Louis, Mo., has been elected a member of the Joint Council of the Associated Engineering Societies of St. Louis to serve for the year which began in June.

McELROY RETIRES FROM MINES BUREAU

G. E. McElroy, Pittsburgh, Pa., is retiring from his position as supervising engineer in the U. S. Bureau of Mines in Pittsburgh.

His retirement marks the end of a period of 42 years in government service, 39 years having been with the Bureau of Mines. For the last 20 years Mr. McElroy has been associated with the Mine Ventilation Section of the Bureau at Pittsburgh.

He has also been active in the work of this Society's technical advisory committees, especially the TAC on Air Distribution. He has also been actively engaged in the preparation of manuscript which has appeared in THE (ASHAE) GUIDE chapters on Air Distribution and Air Duct Design, where his long experience has been of special value.

Mr. McElroy is planning to continue making his home in Pittsburgh.

HONOR FOR KROEKER

On the cover of the May issue of *Consulting Engineer* appears the picture of J. Donald Kroeker, consulting engineer, Portland, Ore.

Mr. Kroeker has long been active in the affairs of the Society, serving as a member of the Council and as Treasurer in 1952. He has also served on numerous Society committees, in the author of several papers in TRANSACTIONS, was first president of the Oregon Chapter, was recently elected to the member grade of Fellow.

NOTTAGE TO LOCKHEED

H. B. Nottage, Encino, Calif., became research specialist on the engineering team at Lockheed Aircraft Corp. at Burbank, Calif., as of the middle of June.

Mr. Nottage is to work in the important fields of thermodynamics, heat transfer and aerodynamics, and his activities will include advancing research in the interesting area of aircraft air conditioning.

It is indicated also that this will include forward-looking studies in other systems for which the total combination makes possible the marvelous creations of present-day and yet-to-come aircraft.

Mr. Nottage plans to continue to reside in Encino, Calif., and to teach air conditioning at University of California at Los Angeles.

ACTIVITIES OF SOCIETY CHAPTERS

The medical profession was well represented at recent chapter meetings as reported. A field trip to Nuclear Energy Center, a number of film presentations, and technical programs, which covered a range of subjects from an engineer's philosophy to the selection of pressure regulations, are also reported. As usual at this time of year the chapters report a host of newly elected officers.

Doctors on the Podium

The medical profession was well represented at recent meetings of the chapters. BALTIMORE Chapter members heard Dr. E. C. Brown, Jr., tell of the effect of diet on arterial sclerosis. The subject proved to be of literally vital interest. • • • Placing the engineer under his scrutiny, Dr. W. R. Atkinson, psychologist and former professor at Southwestern University, gave an effective presentation at a MEMPHIS Chapter meeting. Dr. Atkinson treated the psychological makeup of engineers, with special emphasis on heating and air-conditioning engineers. He noted the aptitudes of engineers for the abstract, the personal and the material. • • • At a meeting of the ST. LOUIS Chapter, held in conjunction with the regular meeting of *ASRE*, the speaker of the evening was Dr. F. B. Engley, Jr., professor and chairman, Department of Microbiology, School of Medicine, University of Missouri. Dr. Engley discussed *Air-borne Disease and its control.* His fine sense of humor and excellent fund of knowledge made the talk outstanding.

Film Presentations

As the program for a MASSACHUSETTS Chapter meeting, R. J. Dilger, technical representative, Dow Corning Corp., Midland, Mich., presented a sound film entitled *What's a Silicone?* He conducted a question and answer period following the informative presentation. • • • A colored film, *The Gift of the Glaciers,* was shown by R. G. Proudfoot to a NORTHERN ALBERTA Chapter audience. • • • An enlightening motion picture on *Corrosion* was viewed by the OTTAWA VALLEY members. • • • ROCKY MOUNTAIN Chapter members enjoyed seeing the picture provocatively called *Please Pass the Condensate.*

Field Trip to Battelle by Central Ohio Members

A field trip to Battelle Memorial Institute's Nuclear Energy Center at Columbus, Ohio, was arranged for the members of the CENTRAL OHIO Chapter and their guests. They were shown the various devices used to formulate experimental operations for the peaceful use of atomic energy. Two superior talks were presented after the tour. Harvey Goering, chief physicist chemist, physical chemical group, spoke of splitting the atom and of using the rays thus produced to provide energy for peaceful applications. Dr. Goering also described the operation of the reactor now being used by Battelle Memorial Institute for experimental purposes. The second speaker, Joel Chastain, the chief reactor physics group, explained the use of electronics to produce mechanical refrigeration.

Technical Programs

The uses of glass foam insulation were enumerated by H. C. Graham, manager,

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Midsouth Division of industrial insulation department, Pittsburgh Corning Corp., New Orleans, La. Mr. Graham spoke at a meeting of the ARKANSAS Chapter. • • • A variety of talks were presented at CENTRAL OHIO Chapter meetings. J. A. Schenk, chief engineer, Alco Valve Co., St. Louis, Mo., spoke on *Balancing the Refrigeration System with the Aid of Proper Flow Control Devices*, and a discussion on boiler burner design for all types of boilers was offered by Jack Jordan, North American Manufacturing Co., Cleveland, Ohio. At a joint meeting of the Central Ohio Chapter and the Columbus Technical Council, Prof. F. A. MacGoun outlined the *Engineer's Philosophy*. • • • EL PASO Chapter members heard A. L. Baker, sales promotion manager, Alco Valve Co., St. Louis, Mo., discuss *Pressure Regulators*, and Curt Pearson, Texsteam Corp. of Houston, Tex., in a talk on boilers and steam generation. • • • As guest speaker at a MEMPHIS Chapter meeting, Arthur White, L.O.F Glass Fibers Co., Toledo, Ohio, noted the uses of glass fiber insulation as duct liner, and the types of insulation and insulation coatings available for this use. On a previous occasion, the members received an address by C. S. Stock, manager, Unit Ventilator Department, American Air Filter Co., Inc., Louisville, Ky., on the *Laboratory School—a Scientific Evaluation of Comfort Conditions and Building Performance.* In recognition of National Engineers Week, the Engineers' Club of Memphis invited the Memphis Chapter of ASHAE, along with the other technical societies, to a dinner meeting; featured on the program was a presentation on *Power for Tomorrow* by Ray Bell, assistant to the vice president, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. • • • A slide presentation and lecture on *Fan Selection and Installation to Obtain Full-Rated Capacity* was given for the benefit of the MISSISSIPPI Chapter members. The informative talk was by R. G. Lubinsky, manager, fan sales department, The Trane Co., LaCrosse, Wis. • • • S. F. Duncan, director of research, Farr Co., Los Angeles, Calif., spoke before a NEW MEXICO Chapter audience on design and application considerations in the use of evaporative cooling. • • • The *Characteristics of Forced Hot Water Heating Systems* were described by Frank Gall, manager, heat transfer department, Bell & Gossett Co., Morton Grove, Ill., for the NORTH JERSEY Chapter members. • • • At recent meetings of the Quebec Chapter, CHAPITRE DE LA VILLE DE QUEBEC, technical presentations were featured Emile Gelinas, representative, Minneapolis-Honeywell Regulator Co. gave a complete treatment of the selection of automatic and motorized valves for reheat and steam coils. J. M. Paquet, manager and senior engineer, Gilles Sarault, Montreal, discussed conditions in Quebec related to the heating problem, with particular reference to ventilation as viewed in that area. He noted the difficulties to be overcome, the way these problems are tackled and what governs the solutions adopted. A third talk by Marc Bain, who is in charge of the Boiler Division, Dominion Bridge Co., covered boilers in general. He mentioned the different types of boilers, their usage and the boiler accessories. • • • A ROCKY MOUNTAIN Chapter program consisted of a talk by W. P. Glancy, Aerofin Corp., Dallas, Tex., on *The Proper Piping and Trapping of Steam coils.* • • • An unusually complete analysis of the air-conditioning picture was scheduled for a ST. LOUIS Chapter meeting. Robert Wright, Jr., sales representative, E. I. du Pont de Nemours & Co., Inc., St. Louis, Mo., related the *Results of 1956 National Central Residential Air-Conditioning Survey.* At another meeting of the chapter, R. G. Cunningham, Shell Oil Co., New York, N.Y., elaborated on *Piping Design for High Temperature Hot Water Systems.* • • • W. L. Lipski, president, Engineered Air Balance Co., Dallas, Tex., debated the necessity for balancing systems in air-conditioning installations. He spoke at a meeting of the SOUTH TEXAS Chapter. • • • The guest speaker at a SOUTHERN PIEDMONT Chapter meeting, J. W. Overland, industrial sound control department, Koppers Co., Inc., Baltimore, Md., treated *Noise Control in Air Distribution Systems.* The ensuing discussion lasted about an hour. • • • On the SOUTHWEST TEXAS CHAPTER agenda, W. P. Glancy, district manager, Aerofin Corp., Dallas, Tex., discussed reheat coils, stratification in steam coils and proper trapping and venting of steam coils. The speaker recommended two-pass construction for hot water coils to lessen the possibility of stratification. In a discussion on boilers at a previous SOUTHWEST TEXAS Chapter meeting, N. R. Collins, Jr., vice president, J. R. Dowdell & Co., Dallas, Tex., covered the history of *ASME* boiler codes and boiler laws. Listing various types of boilers, he classified them according to type of tubes, low pressure, high pressure, residential, etc., and scotch marine boilers. He concluded by showing slides of different types of boiler symbols, as well as various structures and supports for boilers. • • • So successful was a panel discussion presented at a WASHINGTON, D.C., Chapter meeting, that many members hoped a similar program might be scheduled in the near future. L. D. Pain introduced the panel members who lead a discussion on *What's Wrong with Architectural and Mechanical Specifications.* The panel consisted of O. R. Poss, moderator; G. H. Riggs, architect; J. H. Hanline, mechanical engineer; D. W. Fitzgibbons, mechanical contractor; and L. B. Mighell, equipment supplier. Each member of the panel gave a lead-off talk to provoke questions from the audience. The many interesting questions were capably answered by the panel members. • • • *Reduced Voltage Starters* was the subject of an address by Herb Vendrick for the benefit of the WEST TEXAS Chapter.

New Chapter Officers

ARKANSAS Chapter was honored to have D. M. Mills, member of Council and regional director, Regional Area 6, conduct its installation of new officers. Mr. Mills also spoke briefly on the aims of the Society. • • • At the annual ATLANTA Chapter dinner dance and meeting, Pres. F. W. Bull introduced each of the new officers. He expressed his gratitude to the membership for the support received throughout the year. • • • A unanimous ballot was cast for the slate of BALTIMORE Chapter officers. Elected were: *President*—R. E. Dressell; *Vice President*—F. M. Hewitt; *Secretary*—J. H. Baker; *Treasurer*—J. F. Malone; *Board of Governors*—W. G. Robertson, Jr., E. K. Schultz, Jr. and P. L. Harris. The incoming president presented a diamond past president's pin to the retiring president, W. G. Robertson, Jr., in token of the entire chapter's appreciation for his excellent and diligent work as their leader. • • • Following the resignation of W. S. Cooke, Jr., as a member of the board of governors of EL PASO Chapter, M. D. Goodwin was elected to fill the vacancy. • • • At a MASSACHUSETTS Chapter meeting, the outgoing president, W. G. Martin, Jr., presented a new gavel to the incoming president, E. L. Blair, and introduced the new officers for 1957-58. G. W. Sprague made the presentation of the past president's pin to Mr. Martin and urged him to continue his good work in chapter activities and in the affairs of the Society as a whole. • • • An election committee, consisting of R. E. Larkin and John Hilton, III, conducted the election and counted the ballots for MEMPHIS Chapter. Officers for 1957-58 were elected as follows: *President*—R. H. Bolding; *Vice President*—G. B. Ramsey, Jr.; *Treasurer*—H. A. Boudolf; and *Secretary*—H. W. Wade. Pres. W. L. Henson turned the gavel over to the new president. • • • B. L. Palmer, chairman, nominating committee, MISSISSIPPI Chapter, presented the slate of nominees for office. The entire slate was accepted as presented: *President*—T. D. Luke; *Vice President*—D. F. Ingram; *Secretary*—M. E. Arledge; *Board of Governors*—C. M. Stevens, J. W. Doggett, Jr., and C. M. Broad. • • • At the annual NEBRASKA Chapter party, held at the Omaha Country Club with wives and guests invited, Pres. L. J. Paulsen appointed C. L. Thomsen and E. D. Caldwell as a committee to open the sealed votes. The President announced the following results: *President*—M. F. Stober; *Vice President*—E. N. Seiler; *Secretary*—F. P. Manchester, Jr.; *Treasurer*—W. L. Ryan; *Board of Governors*—L. J. Paulsen, B. R. Peterson and V. L. Crane. • • • New officers for the coming year were installed by C. R. Wherritt, retiring president of the NEW MEXICO Chapter. Mr. Wherritt and H. F. Munn received their past president's pins. • • • Pres. W. C. Woods gave a summation of the activities during his term of office and stated that he was pleased to have been the first president of the NORTHERN ALBERTA Chapter. He also expressed appreciation for the support he had received. President Woods installed the following new officers: *President* P. M. Butler; *Vice President* E. K. Cumming; *Secretary*—G. N. Campbell; *Treasurer*—R. A. Williams; *Board of Governors*—Harry Hole, J. S. Michener, A. N. Nordstrom, R. G. Proudfoot and Kornelius Siemens. After accepting the gavel and charter from the out-going president, Mr. Butler said that he was honored by his election to the presidency. • • • Election of officers by the OTTAWA VALLEY Chapter brought the following results: *President*—C. W. Watson; *Vice President*—Jacob Klassen; *Secretary*—A. H. Hargreaves; *Treasurer*—S. J. Bullis; *Board of Governors*—J. W. Green, C. N. Kirby and S. C. Smith. Pres. D. W. Banton reviewed the 1956-57 season and gave the gavel to Mr. Waston. As a token of appreciation for his past services, Mr. Banton received a silver tray, presented by the incoming president. • • • Newly elected officers of the PHILADELPHIA Chapter were introduced: *President*—P. H. Yeomans; 1st *Vice President*—C. J. Forve; 2nd *Vice President*—J. J. Hucker; *Treasurer*—Ludwig Mack; *Secretary*—D. S. Plewes; and *Board of Governors*—John Everetts, Jr. A. M. Robertson made a presentation of the president's plaque to C. J. Lubking. • • • By unanimous vote the ROCKY MOUNTAIN Chapter slate was selected: *President*—D. D. Pearsall; *Vice President*—J. R. Wilson; *Secretary*—J. F. Perkis; *Treasurer*—M. D. Beckett; *Board of Governors*—F. E. Stark, J. E. Harrington and A. S. Widdowfield. • • • Elected to serve the SOUTHWEST TEXAS Chapter were: *President*—C. L. Herndon; *Vice President*—D. T. Kern; *Secretary*—L. A. Ingle, Jr.; and *Treasurer*—Martin Royer. Those who will serve on the *Board of Governors* are W. F. Markey, E. E. Cravens and Boone Crisp. A rising vote of thanks was given to Mr. Crisp for the fine job he did as president. • • • J. F. Guest, retiring president of the TOLEDO Chapter, offered the gavel to the new president, Robert Greenwald. Mr. Greenwald praised the outgoing president for his excellent work during the past season and gave him a chapter president's lapel button with diamond inset. • • • VIRGINIA Chapter held a ladies night together with the installation of officers. Pres. C. G. Conaway, Jr., called the meeting to order and the following officers were installed for the year 1957-58: *President*—D. C. Delinger; *Vice President*—D. L. Gusler; *Secretary*—J. A. Hoffman; *Treasurer*—W. C. Andrews; *Board of Governors*—J. F. Boyenton and A. R. Thompson, Jr. • • • During the annual dinner dance of the WASHINGTON, D.C., Chapter, held at the Congressional Country Club, Montgomery County, Md., H. W. Rush, newly elected president, made the presentation of the past president's pin to J. H. Broome, who was retiring from the presidency. The other new officers are: *Vice President*—J. W. Morgan; *Secretary*—L. D. Pain; *Treasurer*—R. F. Dovener; *Board of Governors*: J. H. Broome, V. L. Frederick and H. E. Grossman. • • • The TEXAS A. & M. COLLEGE Student Branch selected the following new slate to serve: *President*—L. G. Mitchell; *Vice President*—D. B. Manousos; *Secretary*—T. R. Coulter, Jr., and *Treasurer*—J. D. Harris, Jr.

Personals

R. O. Bement and E. T. Hanlon, CENTRAL OHIO Chapter, were appointed to work with a new committee being formulated by the Columbus Technical Council. The purpose of the new group is to entice young people to select the engineering field. • • • Pres. W. G. Martin, Jr., MASSACHUSETTS Chapter, presented a Life Membership citation to R. T. Kern. In his acceptance speech, Mr. Kern sketched his Society activities. • • • NORTH JERSEY Chapter was honored by a visit from J. E. Loucks, assistant director of industry relations, ASHAE Research Laboratory, Cleveland, Ohio. A certificate of Life Membership was presented to H. L. Jones, a member of the North Jersey Chapter. • • • S. C. Smith and C. H. Shock were appointed as auditors for the Treasurer's Financial Statement, OTTAWA VALLEY Chapter. • • • W. P. Norris, president of the ST. LOUIS Chapter, appointed G. B. Rodenheiser and J. B. Killebrew to the nominating committee. • • • The first TOLEDO Chapter Life Membership certificate was presented to H. W. Dirks for his long and active service to the chapter. Mr. Dirks complimented the officers of the past season on the progress made. At the annual golf outing, the trophy for low score was presented to R. H. Abbenzeller by R. P. Lumm, donor of the trophy; the trophy for high score was awarded to E. J. Katafiasz by the donor, R. O. Benington, Jr. The special events chairman, G. W. Bleckner, was complimented by the outgoing president, J. F. Guest, for his fine work in making arrangements for the annual meeting.

CANDIDATES FOR MEMBERSHIP

Listed here are the names of 97 men who are candidates for membership, or advancement in membership grade.

Members are requested to assume their full share of responsibility of receiving these candidates into membership by advising the Executive Secretary before August 31, 1957, of any whose eligibility for membership is questioned. Unless such objection is made these candidates will be voted upon by the Council.

Note: **Advancement* †*Reinstatement*

Arizona (*Region* 4)

LOCKERBY, R. B., Cons. Engr., Phoenix.

MIESSEMER, W. C., Pres., Arizona Refrigeration Supplies, Inc., Phoenix.

California (*Region* 4)

DAVIES, R. B., Sales Engr., The Powers Regulator Co., Los Angeles.

DEVOE, R. J., Sales Engr., Linford Air & Refrigeration Co., Oakland.

GOSMANN, J. L., Design Engr., Daniel, Mann, Johnson & Mendenhall, Los Angeles.

HOTES, DOUGLAS, Marketing Consultant, Reliable Steel Supply Co., Los Angeles.

SCHNORR, R. F., Mech Engr., J. H. Pomeroy & Co., Inc., Los Angeles.

TAPPENDORF, W. A., JR.*, Sales Engr., English & Lauer, Los Angeles.

Florida (*Region* 5)

BOISSONEAULT, L. H., Gen. Mgr., Weatherking of Florida, Inc., Orlando.

DENSON, WALTER, JR.†, Pres., Walter Denson, Inc., Jacksonville.

HERN, ROY, A-C. Engr., Florida Power Corp., St. Petersburg.

JOHNSON, W. W., JR., Owner, National Sheet Metal Co., Jacksonville.

MARCONI, J. A., Partner, Marconi Sheet Metal Co., Jacksonville.

MCMURRY, H. L., Partner, H. L. McMurry & Co., Jacksonville.

ROUNDS, C. H., Pres., Jacksonville Air-Conditioning & Heating Co., Jacksonville.

SANDBERG, MARTIN, Sales Mgr., Jacksonville Air-Conditioning & Heating Co., Jacksonville.

TRIBBLE, W. L., Partner, Tribble, Lee & Warren, Jacksonville.

WHITE, R. C., Pres., White Insulation Co., Jacksonville.

Georgia (*Region* 5)

BALL, S. H., JR., Secy.-Treas., Southeastern Air Conditioning Co., Inc., Savannah.

GODDARD, K. R., Mech. Engr., Assoc., Vice Pres., Thomas & Hutton & Assoc., Savannah.

JONES, D. J., Design Engr., Newcomb & Boyd, Atlanta.

KAGEY, I. B.†, Partner, Newcomb & Boyd, Atlanta.

MCDEVITT, J. L., Pres., Southeastern Air Conditioning Co., Inc., Savannah.

REILEY, R. L.*, Vice Pres., Mingledorff's, Inc., Savannah.

Illinois (*Region* 2)

CARLISLE, W. G., Mgr., Training & Education Dept., Bell & Gossett Co., Morton Grove.

DE MODICA, JOHN, Owner, Marel Air Conditioning & Heating Co., Chicago.

FILKINS, E. M., Vice Pres., Edward Filkins, Inc., Chicago.

KRULEWITCH, B. A.*, Mech. Assoc.; Barancik, Conte and Assocs., Chicago.

Louisiana (*Region* 5)

FISCHER, F. P., JR., Sales Engr., Frank P. Fischer Engineering Co., Inc., New Orleans.

Massachusetts (*Region* 1)

AXTMAN, W. H., Service Supvsr., Metropolitan Coal Co., Cambridge.

O'BRIEN, L. H., Proj. Engr., H. E. Whitten Assocs., Jamaica Plain.

Michigan (*Region* 2)

BASSETT, C. D., Cons. Engr., Ann Arbor.

Minnesota (*Region* 3)

JONES, E. D., Htg. Inspector, City of St. Louis Park, St. Louis Park.

Mississippi (*Region* 5)

HARVEY, W. P., Repr., Mississippi Valley Gas Co., Jackson.

Missouri (*Region* 3)

PFLUG, E. L., Supvsr., Mdse. Sales & Service, The Empire District Electric Co., Joplin.

WILSON, G. E., Bldg. Mgr., Kansas City Power & Light Co., Kansas City.

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New Jersey (*Region* 1)

KAWADLER, GERALD, Engr., Worthington Corp., Newark.

SALVATORIELLO, A. F., Sales Specialist, A-C Dept., General Electric Co., Bloomfield.

New York (*Region* 1)

BECKER, H. P., Sales Engr., A. I. McFarlan Co., Inc., New York.

GOOD, F. P., JR., Mgr., The Charles R. Turner Co., Inc., Buffalo.

RABUSE, WALTER, Mech. Engr., Eastern Mechanical Corp.,New York.

SHERRY, W. H., Cons. Engr., Buffalo.

VENSTROM, E. A., Sales Engr., Koppers Co., Inc., New York.

WALKER, F. G., Proj. Engr., Carrier Corporation, New York.

Ohio (*Region* 2)

DAWSON, R. D., SR., Constr. Supt., Columbus Heating & Ventilating Co., Columbus.

LEIDINGER, B. G., Asst. Constr. Supt., Columbus Heating & Ventilating Co., Columbus.

STOLTZ, R. W., Htg. & A-C. Repr., Industrial-Commercial Unit, The Cleveland Electric Illuminating Co., Ashtabula.

TAYLOR, H. H., Tech. Repr., A-C. & Refrig. Div., Worthington Corp., Cincinnati.

THOMPSON, EUGENE, Partner, United Equipment Co., Columbus.

Pennsylvania (*Region* 1)

AILES, E. R., JR., Repr., The Peoples Natural Gas Co., Johnstown.

ALLEN, H. L., Proj. Engr., National-U. S. Radiator Corp., Johnstown.

ALLWEIN, R. A., Plant Supt., National-U. S. Radiator Corp., Duncansville.

ANTEAU, R. L., Dist. Sales Mgr., Clarage Fan Co., Philadelphia.

BAKER, R. G., Com. Sales Supvsr., Pennsylvania Electric Co., Johnstown.

BRENNEMAN, M. P., Repr., Anchor Sanitary Co., Duncansville.

CONNOR, E. J., Mgr.-Vice Pres., Anchor Sanitary Co., Duncansville.

CONWAY, P. L.†, Sales Engr., National-U. S. Radiator Corp., Johnstown.

GARDNER, G. A., Sales Engr., Allegheny Engineering Co., Johnstown.

GLOSSER, DANIEL, Vice Pres., M. Glosser & Sons, Inc., Johnstown.

GROVE, D. E., Chief Draftsman, Engrg. & Research Dept., National-U. S. Radiator Corp., Johnstown.

HENDERSON, J. K., Archts. Supt., Hunter Campbell & Rea, Johnstown.

HUDSON, R. S., JR., Gen. Mgr. Sales, Htg. & A-C. Div., National-U. S. Radiator Corp., Johnstown.

KELLY, R. D., Mech. Designer, H. F. Lenz Co., Johnstown.

KINSALL, T. E., Estimator, Mulch Bros., Hollidaysburg.

KLEMSTINE, G. W., Partner, Windber Plumbing & Supply Co., Windber.

KOVALCHIK, F. W., Mgr., Plbg. & Htg. Dept., The Swank Hardware Co., Johnstown.

LARKIN, J. T., Pres., John T. Larkin Co., Inc., Johnstown.

LARKINS, T. C., In Charge, Vtg., Htg. & A-C., Sun Shipbuilding & Dry Dock Co., Chester.

LENZ, H. F., Pres., H. F. Lenz Co., Johnstown.

POTTS, J. E., Dvlpt. Engr., National-U. S. Radiator Corp., Johnstown.

ROSE, M. E., Owner & Mgr., Stump Plumbing & Heating Co., Inc., Johnstown.

SCHAEFER, GEORGE, Repr., Anchor Sanitary Co., Duncansville.

SEIDLE, C. S., Instructor, Community College and Technical Institute of Temple University, Philadelphia.

SHELKEY, R. O., Mgr., Finned Surface Htg. Products, Htg. and A-C Div., National-U. S. Radiator Corp., Johnstown.

STAHLER, H. W., Bldg. Engr., Bethlehem Steel Co., Johnstown.

STRAW, E. L., Engr., H. F. Lenz Co., Johnstown.

STRAW, L. W., Cons. Engr., Johnstown.

WADDLE, P. H., JR., Dvlpt. Engr., National-U. S. Radiator Corp., Johnstown.

WOLTER, ALBERT, Instr., Temple University Technical Institute, Philadelphia.

YASKO, R. N., Dvlpt. Engr., National-U. S. Radiator Corp., Johnstown.

Texas (*Region* 6)

HOBSON, W. C., JR., Engr.-Tech., Engineered Air Balance Co., Inc., Dallas.

MOORE, W. A., Owner, W. A. Moore Engineering Co., San Antonio.

Virginia (*Region* 5)

LOPEZ, H. R., Proj. Engr., Engineer Research and Dvlpt. Labs., U. S. Army, Ft. Belvoir.

NICKEL, A. G., Engr., Wm. H. Singleton Co., Inc., Arlington.

Washington (*Region* 2)

WELCH, W. H., Owner, Combustion Equipment Co., Seattle.

Canada (*Region* 7)

DASCHUK, TONY, Htg. Estimator, Samuel Crump Co., Ltd., Toronto, Ont.

McCARTNEY, ERNEST, Tech. Repr., B. F. Sturtevant Canada, Ltd., Toronto, Ont.

McLEOD, W. C., Repr., Douglas Engineering Co., Ltd., Toronto, Ont.

MERRIFIELD, L. L., Engr., Directorate of Construction Engineering Design (RCAF), Ottawa, Ont.

OLIVER, PETER, Htg. Buyer, Simpson-Sears, Ltd., Toronto, Ont.

PENNYFATHER, J. C., Sales Repr., Douglas Engineering Co., Ltd., Toronto, Ont.

WILLIS, E. G., Head, Htg., Vtg. & A-C. Dept., Haddin, Davis & Brown, Ltd., Calgary, Alta.

YEO, E. R., Engr., Catalytic Construction Co., Toronto, Ont.

Australia

WALKER, J. P., Managing Dir., Thomas Walker & Sons (PTY), Ltd., South Melbourne.

Ceylon

BETTINSON, A. C., Sr. Engr., Bousteads (E & C) Ceylon, Ltd., Colombo.

Colombia

DREZNER, MANUEL, Mgr., Ingenieria Ltda., Bogota.

Netherlands

VAN DEN BROEK, PAUL, Cons. Engr., P. W. Deerns N. V., The Hague.

OBITUARIES

HENRY C. MEYER, JR., SOCIETY MEMBER FOR FIFTY-NINE YEARS, DIES AT 86

Henry Coddington Meyer, Jr., a member of the Society since 1898 who served on the Council in 1915-16, died at his home in Montclair, N.J., on June 17, following a lengthy illness. He was 86 years old.

H. C. Meyer, Jr.

Mr. Meyer retired ten years ago as president of Meyer, Strong & Jones, Inc., New York, N.Y., which he established in 1934. His firm was responsible for mechanical engineering work on numerous buildings, including the Empire State Building and Riverside Church, New York, N.Y.; Corcoran Art Gallery and Freer Museum, Washington, D.C.; Yale University, New Haven, Conn.; U. S. Military Academy, West Point, N.Y.; and the Royal Bank of Canada, Montreal.

He was born in 1870 in Orange, N.J., and received his M.E. from Stevens Institute of Technology in 1892. After a period as assistant to G. H. Barrus of Boston, Mass., he joined the editorial staff of *The Engineering Record*, a publication which his father had founded. His father, who had won the Congressional Medal of Honor for gallantry in the Civil War, was a manufacturer of plumbing, steam and gas specialties. One of the duties covered by H. C. Meyer, Jr., during the ten-year period with his father's publication was that of correspondent at the World's Fair of 1893.

In 1902 he opened engineering offices with Bassett Jones in New York. Meyer, Strong & Jones, Inc., was an outgrowth of the original firm.

Mr. Meyer was long active as a Society member. While a member of Council, he served on the Executive Committee in 1916. In later years, he served as a member of the Committee on Code of Ethics and as chairman of the Subcommittee on Infiltration. He is the author and co-author of papers appearing in the Society's *Transactions*. In 1937, he was honored by Life Membership and two years ago was one of a few members who were awarded scrolls in recognition for fifty or more years of Society membership.

He also held membership in the *American Institute of Consulting Engineers* and *ASME*. He was a trustee of the North River Savings Bank of New York and the First Congregational Church of Montclair, and a former member of the board of governors of the Union League Club of New York. In 1945 he received a Stevens Institute award for outstanding achievement. He is the author of a textbook on *Steam Power Plants; Their Design and Construction*.

Survivors include his wife, Mrs. Louise Griffin Underhill Meyer; his son, Henry

C., III, a Society member; and a daughter, Mrs. Emily Peters.

FELIX J. DI BENGA

Montreal, Que.

Felix J. di Benga, mechanical engineer, pulp-paper mill layout, Foundation of Canada Engineering Corp., Ltd., died recently at the age of 73.

Mr. di Benga, who was born in Italy, had a lengthy career in Canada. During the earlier years he worked with the Montreal Locomotive Works and Montreal Harbour Commission. In the nineteen-forties he was chief engineer for Joliette Steel Co., and then became a section leader for John Stadler and for C. J. Jeffreys, in Montreal.

His projects included the Pulp-Paper Mill at Long Lac, Ont., and the heating and ventilating system for Columbia Cellulose, Watson Island, B.C.

JOSEPH S. FILLO

St. Louis, Mo.

Joseph S. Fillo, 35, was killed recently in an automobile accident. He was branch manager of General Controls Co., St. Louis, Mo., since 1952.

Mr. Fillo, who was born in St. Louis, studied chemistry at Central College. He began his career with Monsanto Chemical Co. in 1942, transferring to Fillo Sales & Engineering Co., Inc., four years later.

A member of the Society since 1953, he was affiliated with St. Louis Chapter.

WILLIAM McNAMARA

St. Paul, Minn.

William McNamara, 63, manager, The Trane Co., St. Paul, Minn., died on May 14 in St. Johns Hospital after a brief illness. Mr. McNamara, president of the Minnesota Chapter in 1942, was office manager of the The Trane Co. for twenty-six years.

His birthplace was Winnipeg, Manitoba. He went to St. Paul when he was three years old. Mr. McNamara's early experience in the field was with the Healy Plumbing & Heating Co., St. Paul. Previous to joining The Trane Co. in La Crosse, Wis., in 1925, he was associated with Cochran Sargent Co., St. Paul, for thirteen years.

A member of the Society since 1930, Mr. McNamara served the Minnesota Chapter as vice president and on its board of governors, as well as in the presidency. He held membership in *ASRE*, the *Minnesota Federation of Engineering Societies*, and the St. Paul Engineers Club. Active in his community, he also belonged to the St. Paul Athletic Club, St. Paul Chamber of Commerce, Southview Country Club, the Ancient Free and Accepted Masons, the Scottish Rite and Osman Temple of the Shrine.

Surviving are his wife, Bertha; a son, John W., a Society member; a daughter, Mrs. James C. O'Toole; and seven grandchildren.

A. GORDON RITCHIE

Toronto, Ont.

A long-time member of the Ontario Chapter, Alexander Gordon Ritchie, died suddenly at his home in Toronto, Ont., on June 2, at the age of 72. Mr. Ritchie, who was president of John Ritchie, Ltd., Toronto, Ont., was active right up until the end.

He was born in Toronto and attended the Model School there. At 16 he started his lengthy career in his father's business. After his apprenticeship and several years experience as manager of John Ritchie Plumbing & Heating Co., Ltd., he began engineering work for the Canada Pipe & Steel Co. He returned to John Ritchie, Ltd., as president in 1921, remaining in that post for the last thirty-six years.

This past year he served as chairman of the Ontario Branch of the *National Association of Master Plumbers and Heating Contractors of Canada*. He was a member of the Toronto Board of Trade and the Downtown Business Men's Association. Mr. Ritchie was a member of the Calvin Presbyterian Church and of the Ancient Free and Accepted Masons.

He leaves his wife, Edith Sellers Ritchie; a daughter, Mrs. Donald Lee; two sons, Donald and Roderick; and nine grandchildren.

ALEXANDER S. SMITH

Denver, Colo.

The Society has been informed of the death of Alexander S. Smith, sales engineer, Jenkins Bros., Denver, Colo., at the age of 64. Mr. Smith joined the Society in 1944.

At sixteen, he started with Hendrie & Bolthoff Manufacturing & Supply Co., Denver. For five years beginning in 1930, he was president of "Scotty" Smith, Inc., Denver. Before becoming a representative for Jenkins Bros. in 1940, he was district sales manager for Sparks-Withington Co., Jackson, Mich.

Mr. Smith was a member of the *Colorado Society of Engineers*, *Society of American Military Engineers*, Chamber of Commerce and American Legion.

CHRISTIAN SORENSEN

Indianapolis, Ind.

Christian Sorensen, 53, owner of Comfort Heating Sales & Service, Indianapolis, Ind., died on April 30 in St. Vincent's Hospital. Mr. Sorensen was owner and operator of the company for the past seven years.

He was born in Denmark, moving to the United States in 1920. Fifteen years later he was named service manager, Schwitzer-Cummins Co., Indianapolis. Later he filled the same position for Diamond Iron Works, Minneapolis, Minn., and for Stokol Stoker Co., Inc., Indianapolis.

In addition to being a member of the Society since 1948, Mr. Sorensen served as president of the *Sheet Metal and Air Conditioning Contractors' National Association*, and was a member of the Monument Masonic Lodge and the Athenaeum.

He is survived by his wife, Thelma; a son, Kenneth; a daughter, Geraldine; and two brothers, John and S. C. Sorensen.

ARTHUR THEOBALD

San Carlos, Calif.

Arthur Theobald, who was president of the Southern California Chapter for 1946-7, died suddenly from a heart attack on April 25 at the age of 57. For the past six years, he was chief engineer, Sequoia Manufacturing Co., San Carlos, Calif.

During his twenty years as a member of the Society, Mr. Theobald served in many capacities. He was the Southern California Chapter delegate to the 53rd Annual Meeting of the Society, held in Cleveland, Ohio, in 1947, and that same year was president of his chapter when it played host for the Semi-Annual Meeting at Coronado, Calif. He served in all the offices of his chapter and as a member of the board of governors.

His birthplace was Hinckley, Utah, and he received his education at Millard Academy and Brigham Young University. For a 26-year period beginning in 1922 he was associated with Payne Furnace & Supply Co., Beverly Hills, Calif., progressing from mechanic to chief engineer in charge of research. Previous to joining Sequoia Manufacturing Co., he had a few years association with Southwestern Sheet Metal Works, El Paso, Tex.

He served the *Gas Heating Institute of Southern California* as chairman of its Ordinance and Standards Committees. He was also a member of *A.G.A.* and the *Pacific Coast Gas Association*, having served on the latter's Postwar Planning Committee and Committee on Codes & Regulations, both of which received honor awards.

Having engaged in considerable research, he was credited with the original development of the first direct-fired overhead unit heaters and the closet-type furnace. He supervised preparation of a number of technical papers for publication by industrial societies.

Mr. Theobald is survived by his wife, who resides at their home in San Carlos.

HORACE E. WHITTEN

Boston, Mass.

A Life Member of the Society, H. E. Whitten, president and treasurer of H. E. Whitten Co., Boston, Mass., died recently, at the age of 82. He started as engineer and contractor of H. E. Whitten Co. in 1915.

Mr. Whitten was honored by Life Membership in 1944. He was a member of the Massachusetts Chapter.

He was born and received his education in Plymouth, Mass. For a number of years, he had been living in Somerville, Mass.

He is survived by his widow who resides at Sunny Shores Villa, St. Petersburg, Fla.

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS

(For most recent listing of Society Officers see Frontispiece, JOURNAL SECTION)

Council Committees; General and Special Committees; Nominating Committee

Of the *Council Committees*, only the Program and Papers Committee has a subcommittee and its personnel is listed here. All *General and Special Committees* personnel are listed except the Technical Advisory Committees. See note under *General Committees* covering names of personnel of the Technical Advisory Committees.

Council Committees

Executive: E. R. Queer, Chairman; A. J. Hess, C. H. Pesterfield.

Finance: Walter A. Grant, Chairman; J. N. Livermore, P. J. Marschall, C. H. Pesterfield (Ex Officio).

Membership: J. H. Ross, Chairman; D. M. Mills, W. O. Stewart.

Program and Papers: John Everetts, Jr., Chairman; W. G. Hole, P. N. Vinther.

Program Subcommittee: Walter A. Grant, Chairman, 300 S. Geddes St., Syracuse 1, N.Y.; D. L. Angus, 25 Bayview Wood, Toronto, Ont., Canada; W. P. Chapman, 3816 N. 40th St., Milwaukee 16; L. F. Christofferson, 425-1411 Fourth Ave. Bldg., Seattle 1; C. W. DeLand, 6138 N. Clark St., Chicago 26; B. L. Evans, 4030 Chouteau (Rm. 212), St. Louis 10; C. B. Gamble, 635 Commercial Pl., New Orleans 12; A. S. Gates, Jr., Dept. of Navy, Bureau of Ships, Washington 25; J. B. Graham, 490 Broadway, Buffalo 5; Linn Helander, Dept. of Mechanical Engrg., Kansas State College, Manhattan, Kans.; Fred Janssen, 1123 W. Third Ave., Denver; G. A. Linskie, 2608-A Inwood Rd., Dallas 19; P. J. Marschall, 14th & Sheridan, No. Chicago; W. O. Stewart, 615 N. Alvarado St., Los Angeles 26; H. E. Ziel, 345 New Center Bldg., Detroit.

Regions Central: A. J. Hess, Chairman; John Everetts, Jr. (1); P. J. Marschall (2); A. B. Algren (3); W. O. Stewart (4); C. B. Gamble (5); D. M. Mills (6); W. G. Hole (7).

General Committees

Admission & Advancement: F. H. Buzzard, Chairman (one year); Roswell Farnham (two years); C. S. Koehler (three years).

Publication: W. J. Collins, Jr., Chairman (one year); J. W. May (two years); F. H. Faust (three years).

Guide: M. W. Keyes, Chairman; H. W. Alyea, W. P. Chapman, R. C. Chewning, J. R. Duncan, R. A. Gonzalez, N. B. Hutcheon, R. L. Maher, D. W. Nelson, H. A. Lockhart (Ex Officio).

Charter & By-Laws: J. Donald Kroeker, Chairman (one year); J. C. Fitts (two years); J. S. Locke (three years).

F. Paul Anderson: E. R. Queer, Chairman; John Everetts, Jr., John W. James, A. J. Nesbitt, F. B. Rowley.

Chapters Regional Committees: The list of members and alternate members for the 7 Chapters Regional Committees appears in the April 1957 JOURNAL SECTION, p. 176.

Committee on Research: H. A. Lockhart, Chairman; E. F. Snyder, Jr., Vice Chairman.

Three years: D. D'Eustachio, E. S. Howarth, H. R. Limbacher, E. F. Snyder, Jr., J. I. Trimble.

Two years: F. H. Faust, F. K. Hick, M.D., R. C. Jordan, H. A. Lockhart, Arthur Nutting.

One year: R. C. Chewning, W. S. Harris, N. B. Hutcheon, B. H. Jennings, P. H. Yeomans.

Technical Advisory Committees: These are subcommittees of the Committee on Research. Last published list appears in June 1957 JOURNAL SECTION, p. 182.

Public Relations: B. W. Farnes, Chairman; T. V. Johnson, F. W. Brundage, J. H. Fox, E. K. Wagner.

Standards: K. T. Davis, Chairman; C. B. Gamble (one year); A. B. Algren, A. B. Newton (two years); P. N. Vinther, Albert Giannini (three years).

ASHAE Committee on Assistance to Chapters in Preparation of Local Codes: H. G. Strong, Chairman; J. C. Chamberlain, K. T. Davis, C. L. Grandstaff, W. G. Martin, Jr., H. B. Nottage, C. H. Randolph, A. L. Wales.

ASHAE Committee on Code for Testing and Rating Evaporative Coolers: R. S. Ash, Chairman; S. F. Duncan, H. S. Dutcher, E. F. Gritton, Leo Hungerford, C. B. Rowe, W. T. Smith, J. R. Watt.

ASHAE Committee on Code for Testing and Rating Gravity Type Roof Ventilators: Linn Helander, Chairman; G. C. Breidert, F. N. Calhoon, R. B. Engdahl, W. V. Hukill, J. P. Johnson, K. E. Robinson, F. B. Rowley, L. J. Shumaker.

ASHAE Committee on Code for Testing and Rating Heavy Duty Furnaces: E. K. Campbell, Chairman; Bowen Campbell, A. P. Loeb, C. J. Low, W. J. MaGirl, B. F. McLouth, F. L. Meyer, L. G. Miller, A. A. Olson, H. A. Pietsch, O. J. Ress, H. A. Soper.

ASHAE Committee on Code for Testing Sorption-Type Dehumidifiers: G. L. Simpson, Chairman; G. C. F. Asker, H. L. Barnebey, L. S. Beeler, W. S. Emley, Jr., John Everetts, Jr., A. S. Gates, Jr., R. J. Getty, E. W. Gifford, R. R. Goll, C. F. Kayan, G. A. Kelley, E. R. McLaughlin, R. M. Milton, W. L. Ross.

ASHAE Committee on Safety Regulations for Heating, Ventilating and Air Conditioning Systems: G. P. Nachman, Chairman; F. H. Buzzard, H. W. McKenzie B. F. McLouth, C. H. Randolph.

Committee for Revision of ASHAE Standard Code for Testing and Rating Return Line Low Vacuum Heating Pumps: W. M. Wallace, II, Chairman; H. E. Adams, H. S. Beam, A. H. Church, L. M. Nechine, E. G. Powell, A. O. Roche, Jr., D. W. Whittington.

Committee for Revision of ASHAE Standard Code for Testing and Rating Steam Unit Ventilators: John W. McElgin, Chairman; L. A. Cherry, A. F. Hubbard, E. F. Hyde, D. H. Krans, L. G. Miller.

Joint ASRE-ASHAE Committee on Testing and Rating Equipment with Respect to Noise: F. O. Urban, Chairman; (ASRE) J. B. Chaddock, S. P. Soling; (ASHAE) C. M. Ashley, A. F. Hubbard, R. D. Madison.

Joint Committee on Standards for Comfort Air Conditioning: W. L. Fleisher, Chairman; (ASHAE) O. W. Armspach, A. C. Buensod, C. C. Cheyney; (ASME) C. F. Kayan; (ASRE) F. H. Faust, C. F. Holske, S. P. Soling; (ARI) J. A. Gilbreath, R. A. Gonzalez; Alternate: G. S. Jones, (U.S. Public Health Service) W. C. Cooper, M.D.; At Large: M. K. Fahnestock, P. J. Marschall, G. E. May, A. B. Newton; (Medical Profession) W. J. McConnell, M.D.

Minimum Ventilation Requirements for Air Conditioned Spaces: Albert Giannini, Chairman; C. B. Gamble, R. A. Gonzalez W. J. McConnell, M.D., R. J. Salinger, H. G. Strong.

Special Committees

AAAS Representative: Walter A. Grant.

ASHAE-AIA Committee on Cooperation: John E. Haines, Chairman; C. B. Gamble, John Everetts, Jr., H. C. Hoffmann, R. J. Salinger.

ASHAE-ASRE Committee on Cooperation: ASHAE Representatives — C. B. Gamble, L. N. Hunter, E. R. Queer. **ASRE** Representatives — Cecil Boling, A. J. Hess, H. F. Spoehrer.

Building: A. J. Hess, Chairman; M. F. Blankin, L. N. Livermore, P. J. Marschall, A. J. Offner, R. A. Sherman.

Engineers' Joint Council: P. B. Gordon and E. R. Queer (ASHAE Representatives).

Exposition: E. N. McDonnell, Chairman; John E. Haines, L. N. Hunter.

Guide Advisory: C. E. Price, Chairman; R. E. Cherne, J. C. Fitts, Albert Giannini, J. H. Ross.

Honors and Awards: John E. Haines, Chairman; R. A. Sherman, John W. James, H. A. Lockhart, Ex Officio.

Gustus L. Larson Award: L. C. Plaehn, Chairman; P. D. Gayman, Co-Chairman; B. M. Kluge, Secretary; Bert Fredericksen, F. W. Goldsmith, F. J. Nunlist, Jr., I. J. Rossiter.

Long-Range Planning: John E. Haines, Chairman; E. L. Crosby (one year); John Everetts, Jr., L. N. Hunter (two years); John W. James, J. Donald Kroeker (three years).

NRC—National Academy of Sciences, Div. of Engrg.: John W. James.

Nuclear Energy Engineering: R. A. Sherman, Chairman; W. F. Friend, Walter A. Grant, L. N. Hunter, H. A. Lockhart (Committee on Research).

U.S. National Committee of International Institute of Refrigeration: A. J. Hess, ASHAE Representative.

Nominating Committee

Region	Member	First Alternate	Second Alternate
1	C. W. Stone*	W. C. Kruse, Jr.*	E. K. Wagner*
2	H. G. Gragg*	John Richmond*	D. S. Falk*
3	J. S. Locke*	Fred Janssen*	D. M. Allen*
4	R. M. Stern*	H. B. Nottage*	L. F. Christofferson*
5	J. S. Burke*	G. B. Priester*	F. W. Bull*
6	G. A. Linskie*	G. H. Meffert*	G. T. Donceel*
7	D. L. Angus*	A. C. Martin*	G. C. Davis*
3	B. L. Evans†	G. C. F. Asker† (5)	R. L. Stinard† (1)
4	J. Donald Kroeker†		
6	Reg. F. Taylor†		
7	E. K. Cumming†		

†Selected by Council. *Selected by Chapters Regional Committees.

Architects: VICTOR GRUEN ASSOCIATES • Consulting Engineer: RALPH E. PHILLIPS, Inc.
Contractors: Air Conditioning: J. HERMAN CO., Inc. • Heating: HICKMAN BROTHERS, Inc.

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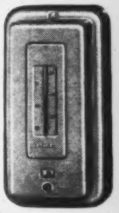
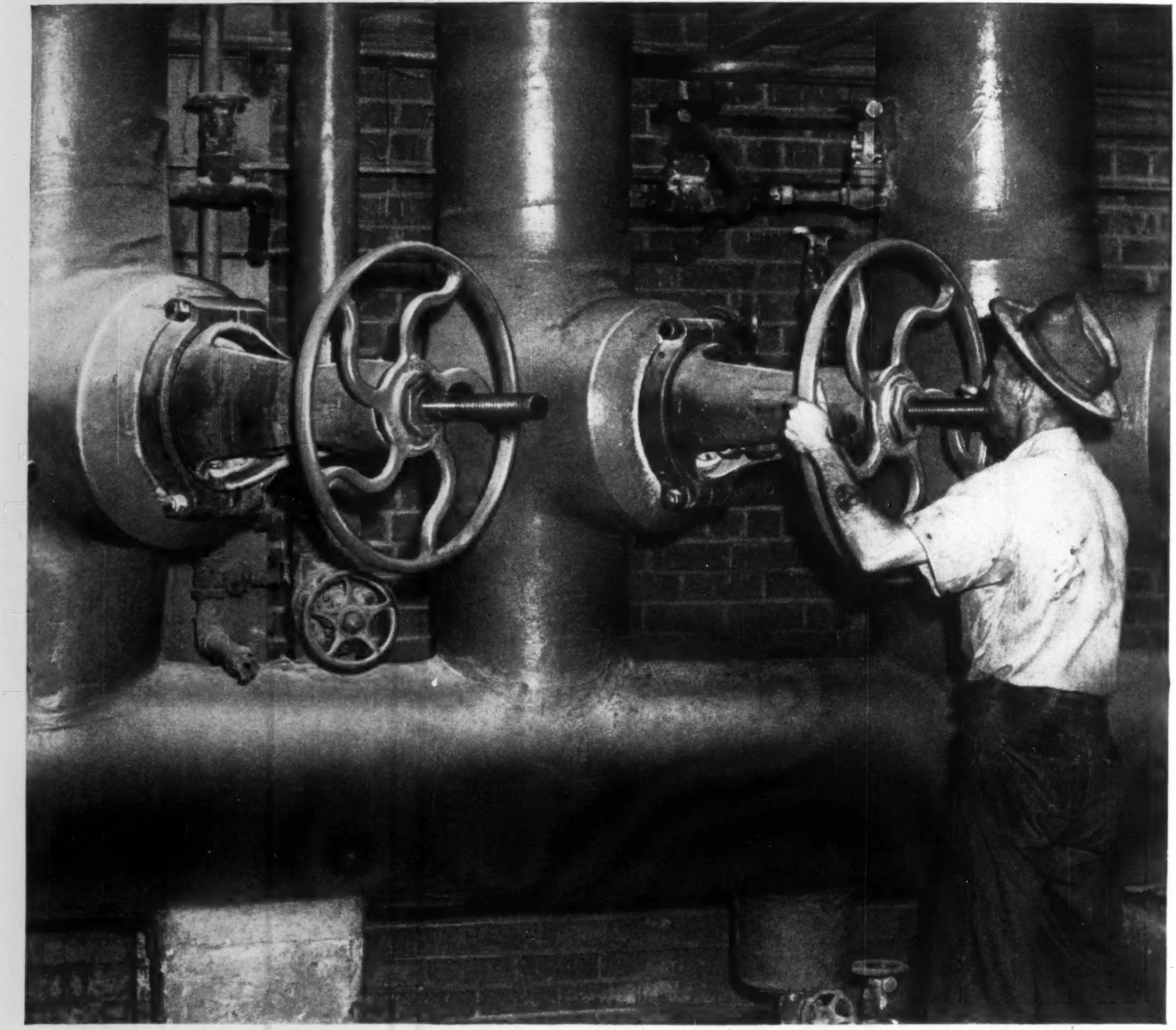
Symbol of Economy and Quality Control



Once set, a Powers pneumatic thermostat, holds temperature constant day after day. It needs no frequent checking or readjustment.

(c39)

No Bonnet-Joint Maintenance—No Bonnet-Joint Leakage



These valves helped the maintenance crew win a losing battle

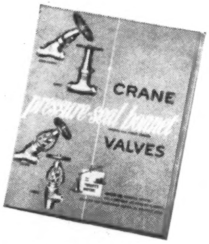
This process industry plant saw the danger signal. Servicing leaky valve bonnet joints was taking too much time. Other important maintenance work was being neglected.

That's why, in 1947, when expanding the power plant, Crane Pressure-Seal Bonnet Gates were chosen for main steam service as shown above. Working pressure: 600 psi at 725 deg. F.

These Crane valves need no bonnet joint maintenance. The joint is leakproof—sealed tight by internal fluid pressure. Crane alloy seats and flexible wedge disc make closure tight and easy.

To date, the Crane Pressure-Seal Gates have given this plant over 9 years' uninterrupted service. The maintenance crew hasn't touched them except for routine care.

Full information on these modern power service valves is given in Circular AD-1936. Get a copy from your Crane Representative or by writing to address below.



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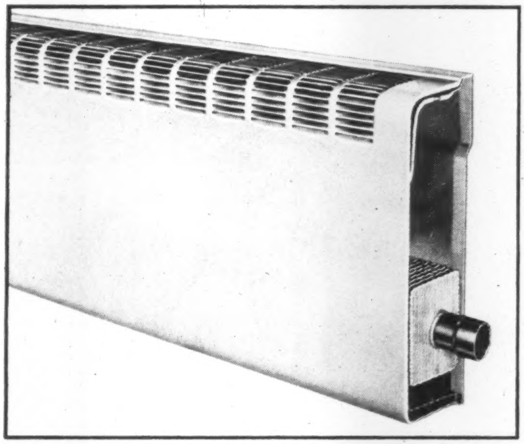
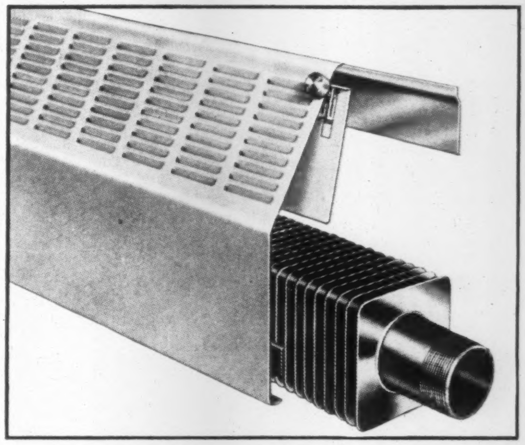
NOW...two types of high-capacity commercial radiation from Crane





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(copper tube with aluminum fins)

- eight types of heating elements in seven lengths (heating capacities of 700 to 2900 Btu per lineal foot)
- five enclosure styles in six colors
- overlapping sleeves eliminate need for cutting enclosures
- sized-to-mate ends reduce installation costs
- exclusive corrugated aluminum fins provide more heating surface—double rigidity.

2. STEEL Tube Sunnywall

(steel tube with steel fins)

- five types of heating elements in seven lengths (540 to 3280 Btu per lineal foot capacity)
- three enclosure styles (sloping front, flat top and expanded metal) from 2′ to 8′ lengths in increments of 3″
- curved elements (and other special types) available on order
- exclusive hub design on fins gives maximum conductance between tube and fin

Full line of accessories and optional equipment makes it possible for copper or steel Sunnywall radiation to fit any installation

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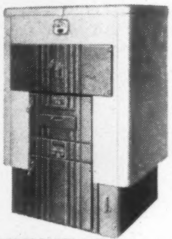
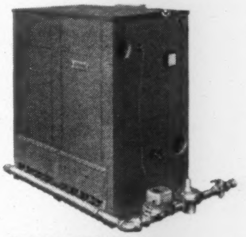
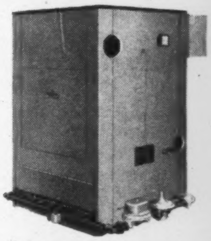


SUNNYDAY 30
268,000 to 1,367,000 Btu/hr.
gross IBR output



SUNNYDAY 40
350,000 to 2,380,000 Btu/hr.
AGA input



SUNNYDAY 60
625,000 to 5,000,000 Btu/hr.
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How can an underground piping system be watertight when you can't *AIR TEST* it?

Test caps applied to unit ends for air testing full-welded conduit system.

During air test, conduit field welds are checked with soap solution.

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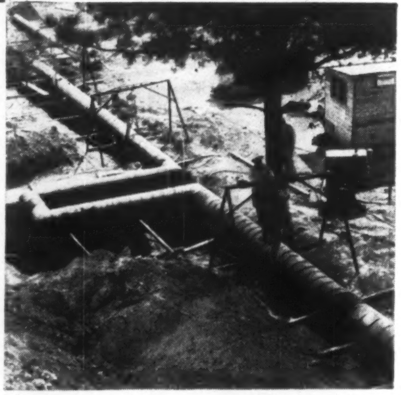

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The RIC-WIL method of making full-welded field closures allows the installer to AIR TEST the system prior to completion and backfilling. This simple 15 lb. pressure test gives greater assurance of a tight, leak-proof system. It provides the finest practicable protection to the owner against an initial system failure ...and most important, the long range effects of water corrosion.

Ask a RIC-WIL field representative for detailed information regarding Air Test procedure or write for catalog covering recommended field installation details . . . and remember, it pays to do it RIGHT the first time . . .

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PREFABRICATED **INSULATED PIPING SYSTEMS**
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IN CANADA: THE RIC-WIL COMPANY OF CANADA LIMITED

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June 1956

INDUSTRIAL QUALITY
FRACTIONAL
HORSEPOWER
48 FRAME AND
56 FRAME
1/20 to 1 HORSEPOWER

OPEN AND ENCLOSED TYPES
PAGES 3 TO 6
MECHANICAL VARIATIONS
PAGE 7
ELECTRICAL TYPES
PAGE 8
RATINGS AND DIMENSIONS
PAGE 9

Century

Performance Rated°

A NEW CONSOLIDATED LINE
OF INDUSTRIAL QUALITY ELECTRIC
MOTORS. NEW AND IMPROVED
MATERIALS, DESIGNS AND
OPERATING FEATURES

Performance Rated°
MOTORS
Complete Line
1/20—400 H.P.

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1806 Pine Street, St. Louis 3, Mo.

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MOTORS
1/20 to 400 H.P.

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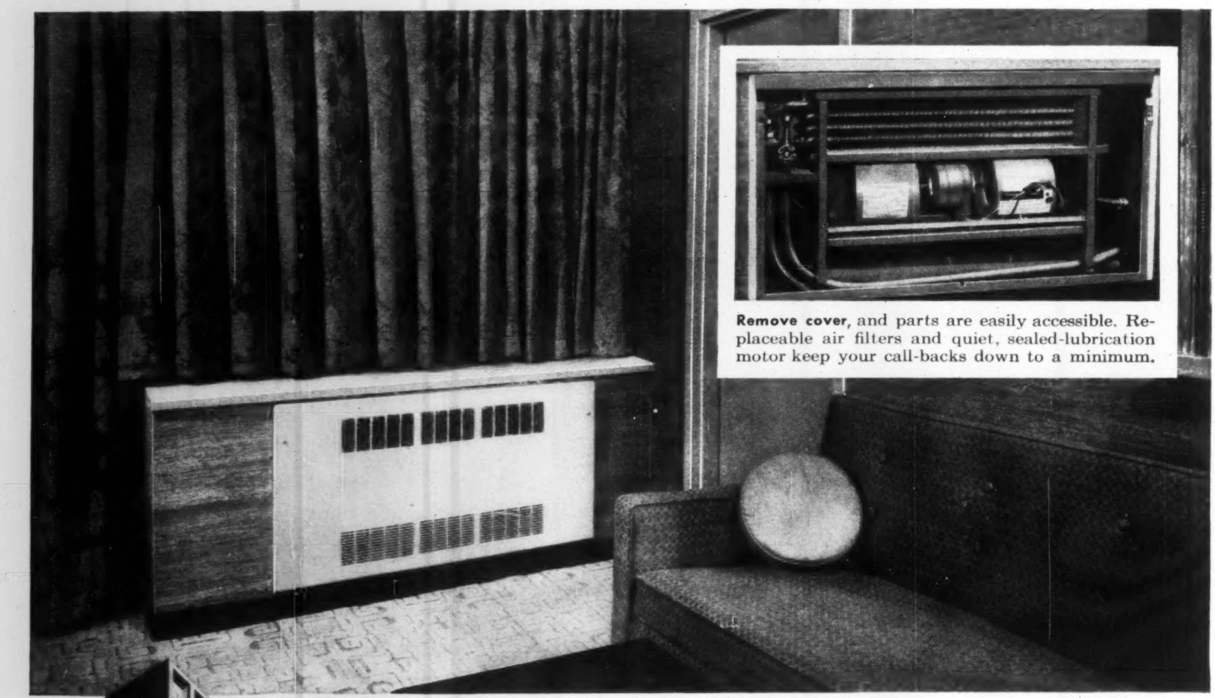
CENTURY ELECTRIC COMPANY

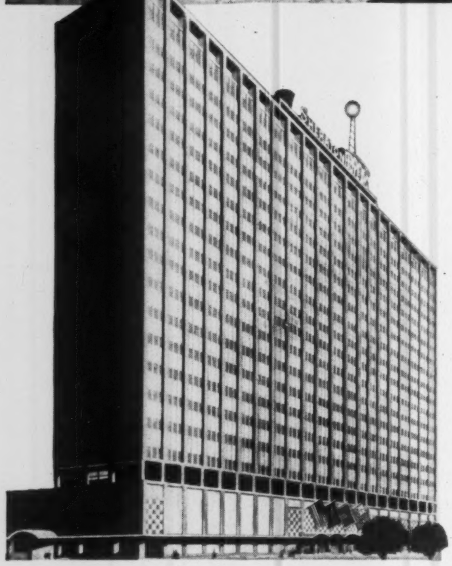
1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

CE-62R

917 AMERICAN-Standard year 'round air conditioners in new Sheraton Hotel



Remove cover, and parts are easily accessible. Replaceable air filters and quiet, sealed-lubrication motor keep your call-backs down to a minimum.



Brilliant new Sheraton Hotel, 1725 Pennsylvania Blvd., Philadelphia 3, Penna., has 917 guest-pleasing rooms featuring American-Standard air conditioning.

More and more large buildings, like the smart, new Sheraton Hotel in Philadelphia, contract for dependable Remotaire year-round air conditioning installations.

Individual room temperature controls make this quality-made American-Standard system popular with hotel, motel, office and apartment building owners. At the twist of a dial, guests or tenants can cool or heat the air to suit themselves. Its whisper-hushed operation makes it especially desirable in buildings where restful quiet is needed. And there is no cost for yearly removal and storage of units—they are in to stay.

Fast, easy and economical to install, the Remotaire system needs no time-wasting, space-consuming ducts. Two 350-ton American Blower Tonrac® Centrifugal Refrigerating Machines supply chilled water for the entire system.

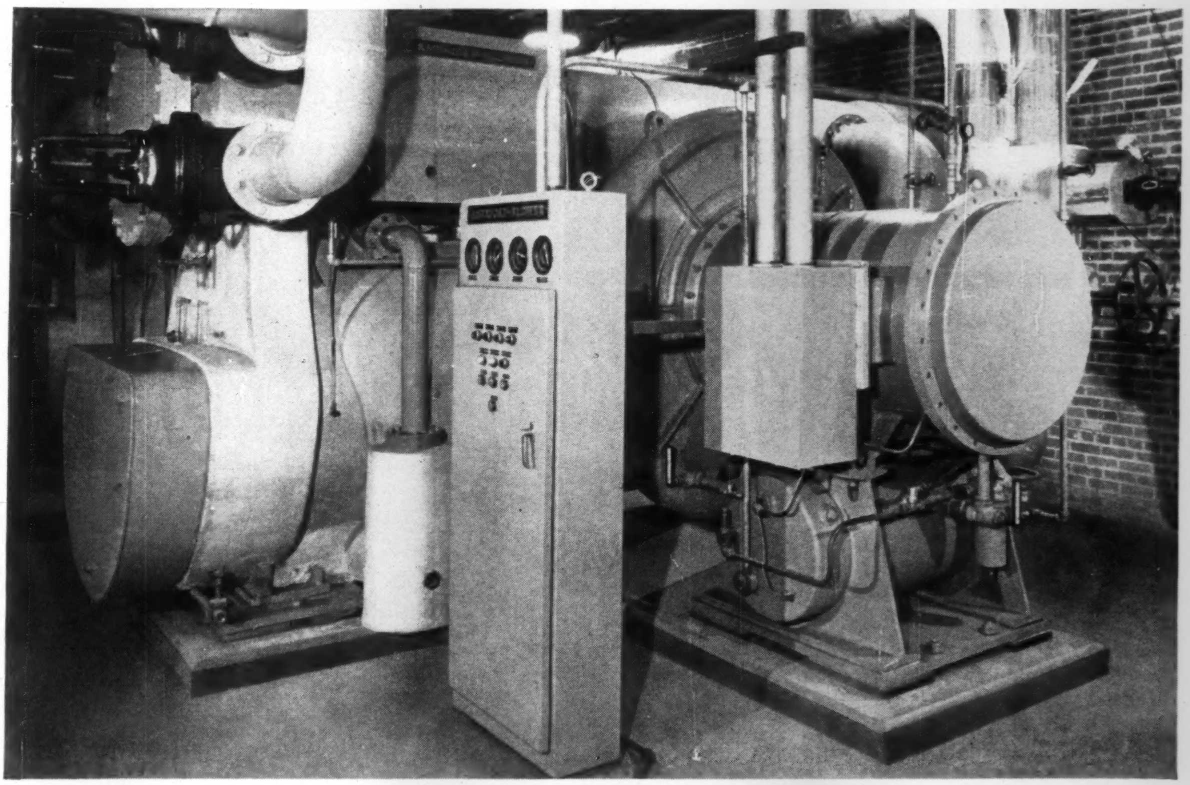
For added information on this down-to-earth client pleaser, call your distributor or write: AMERICAN-STANDARD, PLUMBING & HEATING DIVISION, 40 W. 40th Street, New York 18, N. Y.

Another American-Standard development in hydronics—
the science of heating and cooling with water.

AMERICAN-Standard

PLUMBING AND HEATING DIVISION

AMERICAN BLOWER AIR CONDITIONING



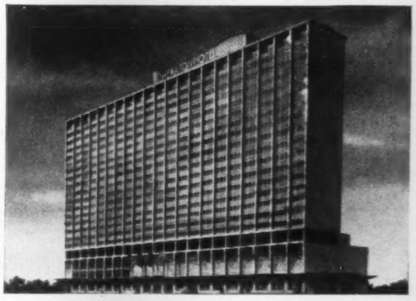
Two 350-ton American Blower Tonracs supply chilled water for the entire Sheraton air-conditioning system.

Tonrac®—heart of the air-conditioning system in Philadelphia's new Sheraton Hotel

To help extend a traditional Sheraton welcome to travelers in the City of Brotherly Love, engineers, builders and mechanical contractors selected two American Blower Tonrac Centrifugal Refrigerating Machines to supply the air-conditioning system in the new Sheraton Hotel.

They chose Tonracs on the basis of their high capacity; their quiet, vibration-free operation; and American Blower's engineering know-how and reputation as a leader in the air-handling and air-conditioning field. The Tonracs supply all the chilled water for 1,000 individual American-Standard Remotaire room units that air-condition 5,700,000 cubic feet of space.

When your client's plans call for air conditioning—call our nearest branch office for invaluable product information. American Blower Division of American-Standard, Detroit 32, Michigan. In Canada: Canadian Sirocco products, Windsor, Ontario.



The 22-story Sheraton Hotel, Philadelphia. Tonracs, installed on the fourth floor, operate so quietly that guests on adjoining floors never hear a sound.

Building Credits

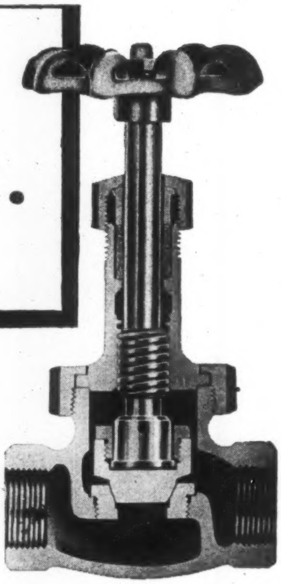
Architects: Perry, Shaw, Hepburn & Dean
Consulting Engineers: Slocum & Fuller
Builders: McCloskey & Co.
Mechanical Contractors: Ambrose-Augusterfer Corp.

AMERICAN BLOWER

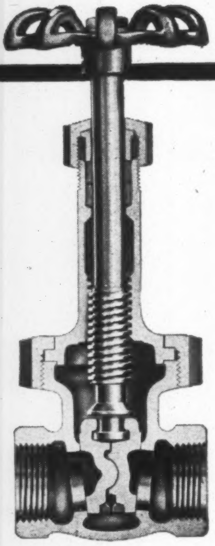
Division of American-Standard

QUALITY PROTECTS YOUR INVESTMENT . . . American-Standard QUALITY IS AVAILABLE AT NO EXTRA COST

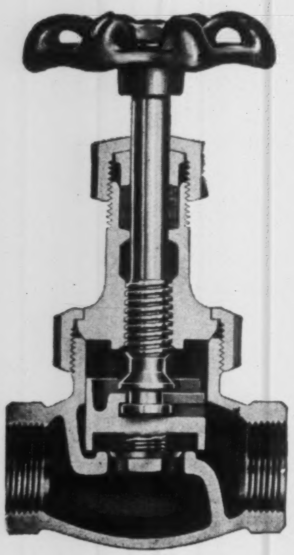
Walworth bronze valves...



Walworth No. 225P Globe Valve
500 Brinell Seat and Disc



Walworth
No. 29 Gate Valve



Walworth No. 95 Globe Valve
Re-New-Disc

built to give dependable trouble-free service on all recommended jobs

Walworth No. 95 Bronze Globe Valves (Angle Type: No. 96) are recommended for service where throttling is not required. They are rated at 150 psi working steam pressure, 500F; 300 psi cold water, oil or gas. The improved renewable disc and lock-on, slip-off disc holder — an original Walworth development—saves time and trouble. This valve can be repacked under pressure when fully opened. All parts are designed to give maximum service and strength.

Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including ¾-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, TOUGHEST bronze valves you can buy.

For full information about Walworth Quality Bronze Valves, see your Walworth distributor, or write:

GLOBE GATE ANGLE

WALWORTH
valves and fittings
60 EAST 42nd STREET NEW YORK 17, N. Y.

CHECK

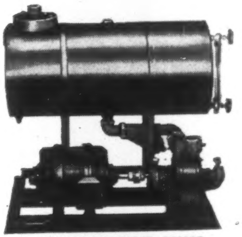
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

NO NEED FOR CUSTOM JOB

A standard type Skidmore Pump will meet the exacting requirements

"CVS" VERTICAL PUMP

"HS" CONDENSATE PUMP



"TM" TURBINE PUMP

"UV"
CONDENSATE PUMP

4 ways . . . to improved pump performance!

TYPE "CVS"

New, wider range of discharge pressures—from 10 to 40 lbs. Capacities range from 500 to 10,000 sq. ft. E. D. R.

TYPE "HS"

Sturdily constructed for dependable service at small investment — capacities 1,000 to 65,000 sq. ft. E. D.R., discharge pressures from 10 to 75 lbs.

TYPE "TM"

Completely assembled on either steel or cast iron base —capacities, for boilers up to 250 H.P., with discharge pressures to 150 lbs.

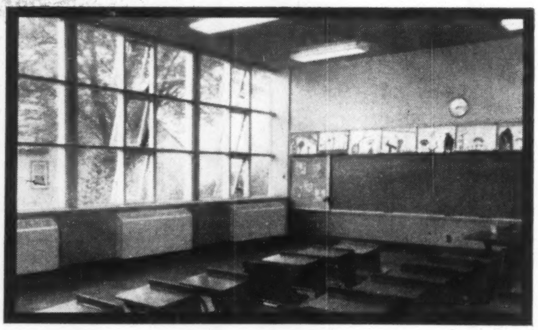
TYPE "UV"

Designed for low return installations — capacities, 2,000 to 40,000 sq. ft. E.D. R. and discharge pressures from 10 to 75 lbs.

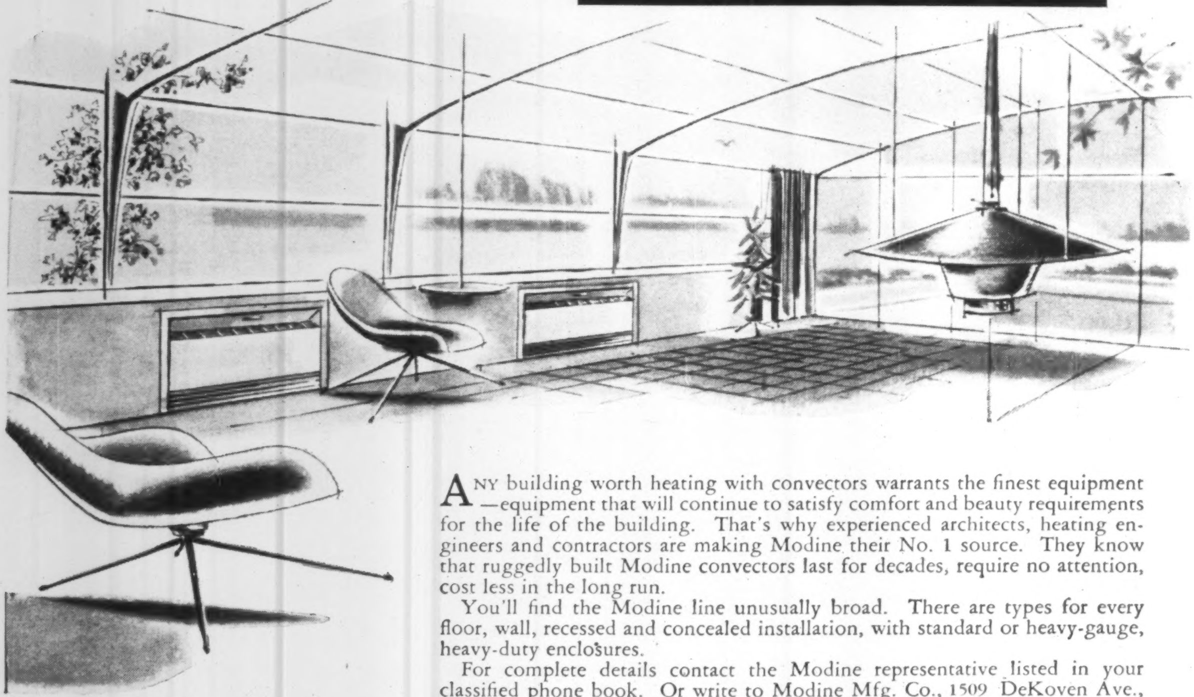
SKIDMORE CORPORATION
ST. JOSEPH, MICH.

Choose with Confidence!

PLAN FOR 1999 with MODINE convector radiation



30 types, 8,000 sizes ...to help you plan for the years ahead

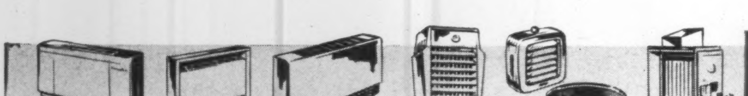


ANY building worth heating with convectors warrants the finest equipment —equipment that will continue to satisfy comfort and beauty requirements for the life of the building. That's why experienced architects, heating engineers and contractors are making Modine their No. 1 source. They know that ruggedly built Modine convectors last for decades, require no attention, cost less in the long run.

You'll find the Modine line unusually broad. There are types for every floor, wall, recessed and concealed installation, with standard or heavy-gauge, heavy-duty enclosures.

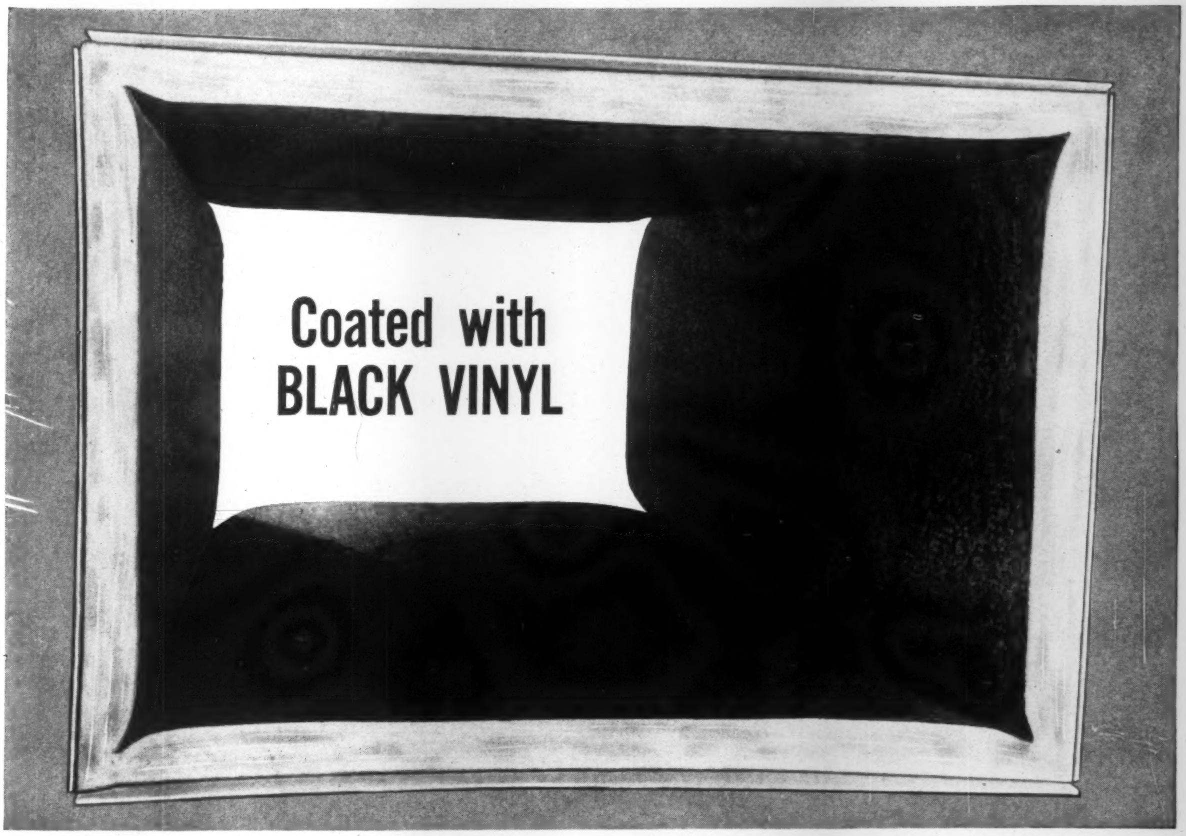
For complete details contact the Modine representative listed in your classified phone book. Or write to Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wisconsin. Ask for Catalog 257.

R-1352



In Canada: Sarco, Ltd., Toronto

Modine
MANUFACTURING COMPANY



NEW MICROTEX DUCT LINER

saves cost of painting inside ducts; insures complete protection against air erosion; helps speed fabrication

Now you can get duct liner with high acoustical and thermal insulating efficiency . . . *plus* the money-saving advantages of black vinyl coating. Here's why it pays to specify L·O·F Glass Fibers' new Microtex Duct Liner:

1. No painting duct interiors—Black vinyl-coated Microtex saves the cost of painting ducts inside, near grills or large registers. Factory-pigmented coating eliminates chance of paint flaking off into air-stream.

2. Insures full coating—Its black vinyl coating marks the quality of L·O·F Glass Fibers' Microtex Duct Liner. Quality-control inspectors can *see* it's *fully coated* to resist air erosion, even at peak velocities.

3. Saves fabrication time—Pigmented vinyl clearly marks the air-stream side of Microtex Duct Liner. Shows at a glance which side to apply toward adhesive before forming the sheet metal in the brake.

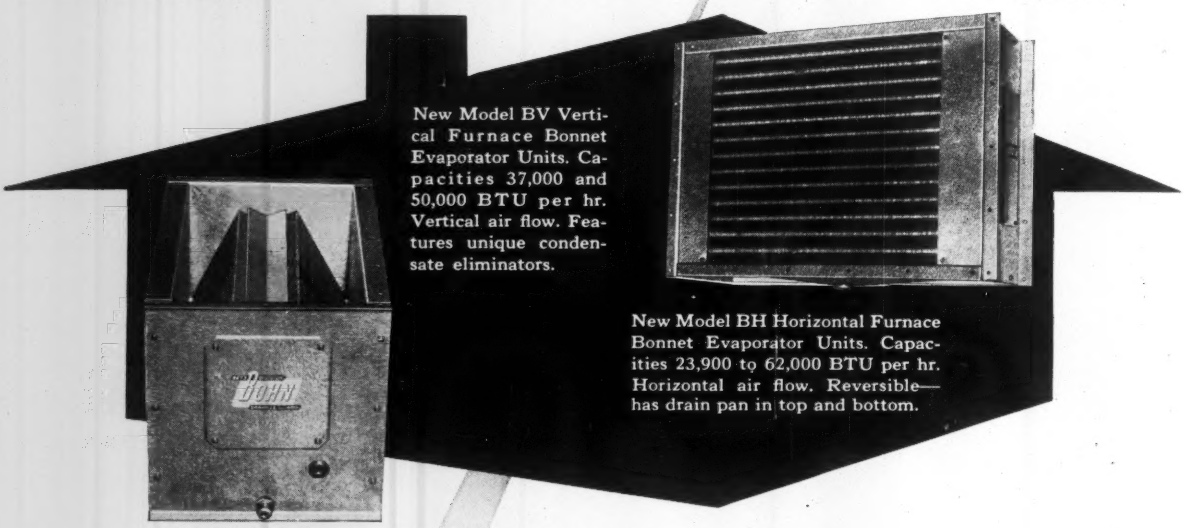
L·O·F Glass Fibers' Microtex Duct Liner offers maximum insulation per dollar. Made from fine glass fibers, it absorbs mechanical noises, particularly in the 250 to 4,000 cps range where most heating and air-conditioning system noises occur. It efficiently insulates warm- and cold-air ducts against heat transfer. When lined with Microtex, the metal of the duct acts as a vapor barrier, minimizing condensation.

Get the facts today on economical Microtex Duct Liner in 1½, 2 and 3 lb./cu. ft. densities. Contact your distributor, or write: *L·O·F Glass Fibers Company, Dept. 39-87, 1810 Madison Ave., Toledo 1, Ohio.*

L·O·F GLASS FIBERS

L·O·F GLASS FIBERS COMPANY · TOLEDO 1, OHIO

BOHN Presents the NEW ANGLE



New Model BV Vertical Furnace Bonnet Evaporator Units. Capacities 37,000 and 50,000 BTU per hr. Vertical air flow. Features unique condensate eliminators.

New Model BH Horizontal Furnace Bonnet Evaporator Units. Capacities 23,900 to 62,000 BTU per hr. Horizontal air flow. Reversible—has drain pan in top and bottom.

Residential Evaporator Air Conditioning Units

No Dead Air Space • Insulated Cabinets

The NEW ANGLE in residential air conditioning design offers you many selling and installation advantages!

Only BOHN units provide a patented distributor employing a low pressure drop venturi which aids compressor efficiency. Minimum pressure drop. No equalizer required.

Only BOHN units contain special condensate drains to separate water from air flow in either direction! Air flows efficiently through the coil for maximum heat transfer *without dead air space.*

Heavy gauge grained aluminum cabinets and access panels are insulated to eliminate exterior sweating! Rust-proof. No painting required.

All models are U L listed. For details and specifications, request BOHN CATALOG BU-1.

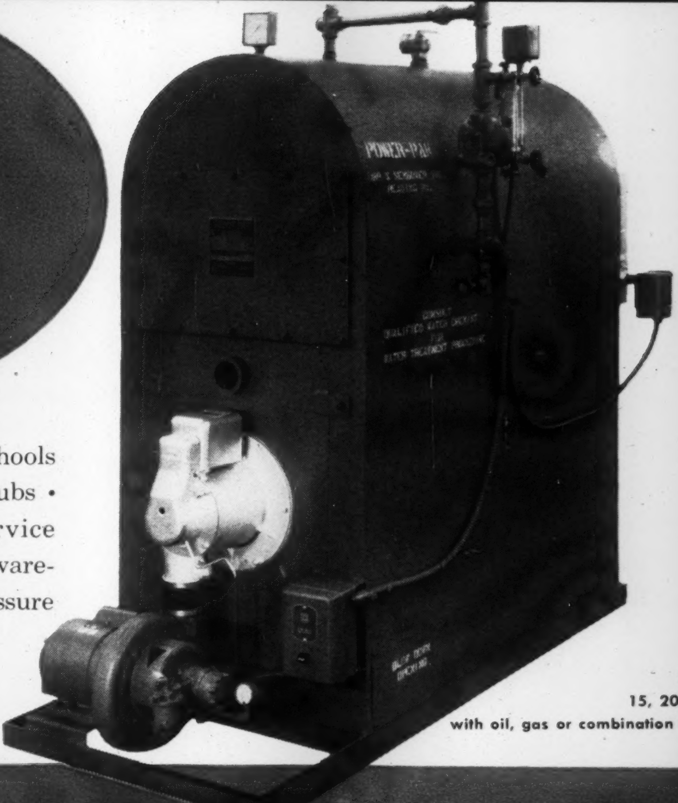
BETZ DIVISION
BOHN
DANVILLE, ILLINOIS

Manufacturers of Commercial Refrigeration. Industrial Air Conditioning and Special Heat Transfer Surfaces

BOHN ALUMINUM & BRASS CORPORATION • BETZ DIVISION • DANVILLE, ILLINOIS

today's best boiler buy for low-cost heating for . . .

apartments • office buildings • churches • schools • markets • stores • motels • camps • clubs • restaurants • bakeries • garages • service stations • greenhouses • launderettes • warehouses • industrial plants • other low-pressure steam or hot-water heating needs



3 SIZES
15, 20, 25 hp
with oil, gas or combination burners

O&S

POWER-PAK®

packaged automatic boiler

QUICK DELIVERY from stock NOW!

money-saving advantages

- completely factory-assembled
- space-saving compactness
- time-saving installation
- factory fire-tested
- factory-insulated steel boiler
- fast steaming
- industrially-rugged burner
- 5 sq ft of heating surface per hp
- automatic operating and safety controls
- forced draft—no chimney needed
- clean, quiet operation
- easy over-all accessibility
- one-source responsibility for entire unit
- nation-wide factory-schooled service

Here's the boiler that will save you time, money, space and trouble in providing really low-cost, low-pressure steam or hot-water heating for a wide variety of commercial, industrial and institutional needs. Besides heating, POWER-PAK can supply hot water service (storage tank or instantaneous) for washrooms, kitchens and other utility outlets as required.

Multiple-unit installations offer attractive advantages over larger single boilers for heating loads above 25 hp. Many POWER-PAK units are now in service or ordered for widely different requirements where dependability, economy and freedom from attention are important considerations. Get the full story on POWER-PAK for new installations or replacements of heating boilers you may be planning now. Ask for Bulletin 1243.

Builders of Dependable Boilers Since 1885

ORR & SEMBOWER, INC.

Morgantown Road, Reading, Pa.

Specify RECO

Boiler Plant, West Wing and Mercy Hall—St. Mary's Hospital, Knoxville, Tenn.
Consulting Engineers—A. F. G. Bedinger, Knoxville, Tenn.—H. F. Wilson, St. Louis, Mo.
Architects—David B. Liberman, Knoxville, Tenn.—Maguolo & Quick, Cincinnati, Ohio.
Contr.—John F. Whelahan Co., Knoxville, Tenn.
RECO Representative—Dickey Engineering Co., Knoxville, Tenn.

Hot Water Treatment by RECO for St. Mary's Hospital

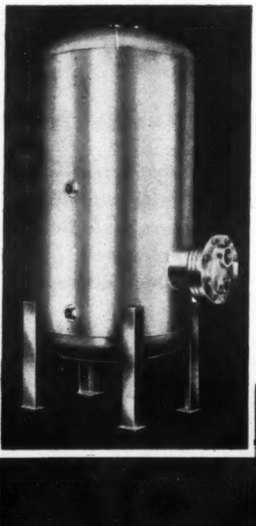
When it comes to hot water, a hospital really pours it on. That's why the consulting engineer "prescribed" RECO water heating equipment for the new buildings at St. Mary's.

The complete RECO installation includes convertors, storage heaters, expansion and bulk storage tanks. 17 units in all . . . Guaranteed to keep plenty of rust-free hot water always on tap.

If you're interested in guaranteed top quality heat exchange equipment—delivered quickly and priced right—SPECIFY RECO on *your* next heating job.

Write for free catalogs plus name of nearest RECO representative.

Dept. N, Richmond Engineering Co., Inc., 7th & Hospital Sts., Richmond 5, Va.



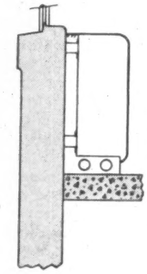
RICHMOND ENGINEERING CO., INC.

QUESTION

What's The Right Hot Water System For CLASSROOMS?

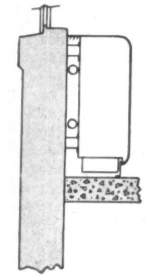
ANSWER

No ONE System Can Be Right For Every Job—That's Why Herman Nelson Gives You A Choice of Three!



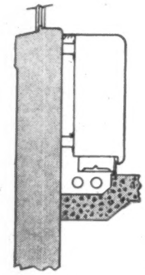
CABINET-BASE PERIMETER PIPING

Supply and return piping is laid on the floor beneath units and cabinets. Easy to install, easy to maintain (any Herman Nelson cabinet can be individually removed). Piping requires no additional building volume and it may be insulated to reduce uncontrolled heat gain.



WALL-HUNG PERIMETER PIPING

All piping is contained within the mechanical equipment, and all piping through the unit is furnished, including expansion loops as well as balancing valves and air vents. Piping and hangers with both cabinets and DRAFT|STOP wall are available.



RECESSED-EDGE PERIMETER PIPING

This easily-installed depressed slab system offers definite control of slab edge loss, makes lower-cost insulation possible (insulating material is merely poured over piping). This system is recommended where classrooms have exterior doors that would otherwise have to be looped.

That's right—there is no "one best" hot water system. Each school must be considered on its own requirements—architectural design, structure and climate. That's why famous Herman Nelson unit ventilators offer you a choice of three hot water perimeter piping systems. You can select the one that fits your needs—exactly . . . that gives the school *more classroom comfort per dollar.*

Herman Nelson hot water systems offer many other advantages, too. Both to you *and* to the school. You have greater flexibility in pipe location. You can use smaller piping, smaller pumps. You also get better temperature control.

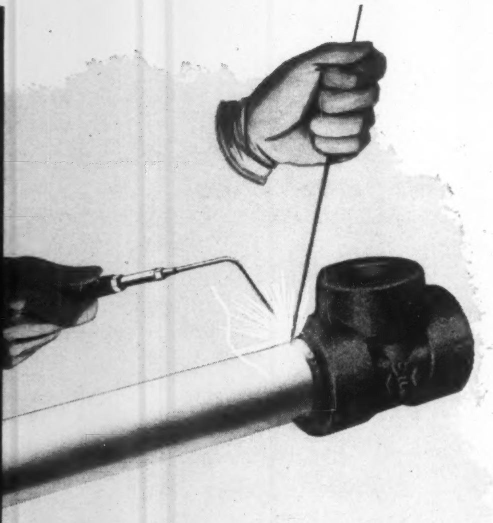
Why not get all the facts? Ask your Herman Nelson representative, or write to Herman Nelson Products, American Air Filter Company, Inc., Louisville 8, Kentucky.

AAF

herman nelson

UNIT VENTILATOR PRODUCTS

System of Classroom Cooling, Heating and Ventilating

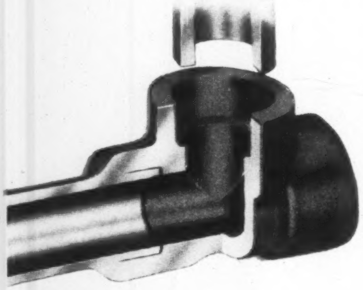


Weld Your Small Piping

the easy way

with W-S Socket-Welding Fittings

You can cut welding costs . . . and get clean, pressure-tight joints in small diameter pressure piping with W-S socket welding forged steel fittings. Welding is easy and quick. Deep sockets help support and align the pipe. Outside-the-pipe fillet weld means no welding icicles inside the pipe . . . and no need for backing rings. W-S Socket-Welding Fittings are available in sizes 1/8″ to 4″ in 2000, 3000 and 6000 lb. pressure classes. For resistance to high temperatures and corrosion W-S socket-welding fittings can be obtained in 3 chrome-moly alloy steels and in types 304, 316 and 304 ELC stainless steel. For detailed information write to W-S Fittings Division, H. K. Porter Company, Inc., P. O. Box 95, Roselle, N. J.



HKP W-S FITTINGS DIVISION
H. K. PORTER COMPANY, INC.

BOOKS

of reprinted material from Heating, Piping & Air Conditioning. You'll get same day shipment — postage paid — when you send check with book orders to Keeney Publ. Co., 6 N. Michigan, Chicago 2, Ill.

★ ★ ★

INDUSTRIAL AIR CONDITIONING HANDBOOK

Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, increase worker efficiency and operate systems economically. 186 pages, $1.50

INDUSTRIAL PIPING

A practical volume which reveals how various difficult piping problems in different industrial plants were successfully worked out by piping experts. Design, installation, operation, and maintenance. . . .steam, air, gas, oil, process, water and refrigeration piping. . . .piping in pulp and paper and steel mills, and other manufacturing plants is dealt with from different angles. 196 Pages, 8½″ by 11″, $1.50.

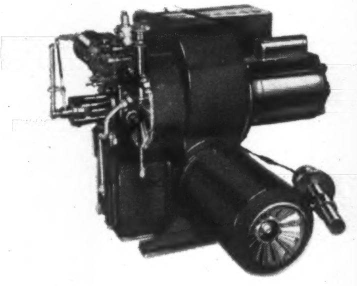
SNOW MELTING MANUAL

Complete information on correct design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc. 20 pages, 50c

★ ★ ★

Believe us! We *know* why Cadillac once published an advertisement titled,

"The penalty of Leadership"



No leader can escape the attention of imitators! There's proof of this rule in Cleaver-Brooks' HEV-E-OIL—*today's most-copied heavy oil burner*

As stated in the Cadillac advertisement many long years ago, "In every field of human endeavor, he that is first must perpetually live in the white light of publicity. Whether the leadership be vested in a man or in a manufactured product, emulation and envy are ever at work."

The Hev-E-Oil burner was a standout from the start and continuing research and design refinement further extended initial leadership. Hev-E-Oil features were imitated, of course — not in their entirety but in adaptations and "pick-ups" appearing on a variety of heavy-oil burner designs.

"Jealousy does not protrude its forked tongue at the artist who produces a commonplace painting . . . The leader is assailed because he is a leader, and the effort to equal him is merely added proof of that leadership."

When introduced eighteen years ago, the Hev-E-Oil burner was (and still is) the first and only burner *successfully* applying the principle of low pressure air atomization of heavy fuel oils *inside the burner nozzle.* At last — a burner that could properly use low-cost, high-heat-content heavy fuel oils, such as No. 5. The early and immediate success of Hev-E-Oil naturally was followed by the usual imitators—competition scrambling to find "something just as good."

"If the leader truly leads, he remains — the leader . . . That which deserves to live — lives.

Consider these Hev-E-Oil exclusives:

- — true air atomizing, with the oil atomized inside the burner nozzle by low pressure air.
- — all air for combustion furnished by the burner independent of natural draft.
- — starting delayed until oil temperature is correct for electric ignition.
- — automatic pressure lubrication with *lubricating oil.*
- — the only line of combination oil and gas burners burning either fuel at maximum efficiency.

These are the Hev-E-Oil burner features that make it so modern it'll be new and unequalled for years to come.

Write Today for Complete Information

CLEAVER-BROOKS COMPANY, BURNER DIVISION, Dept. J, 392 **East Keefe Avenue, Milwaukee 12, Wisconsin**

Cleaver Brooks

HEV-E-OIL BURNERS — 27 MODELS — 5 GPH TO 90 GPH CAPACITY — INCLUDING COMBINATION HEAVY OIL AND GAS OR, LIGHT OIL AND GAS FIRED MODELS.

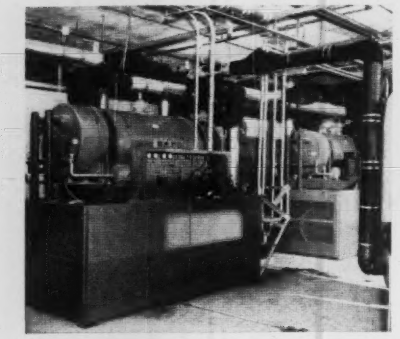
FREON* REFRIGERANTS IN AIR CONDITIONING

Field Reports About Successful Installations

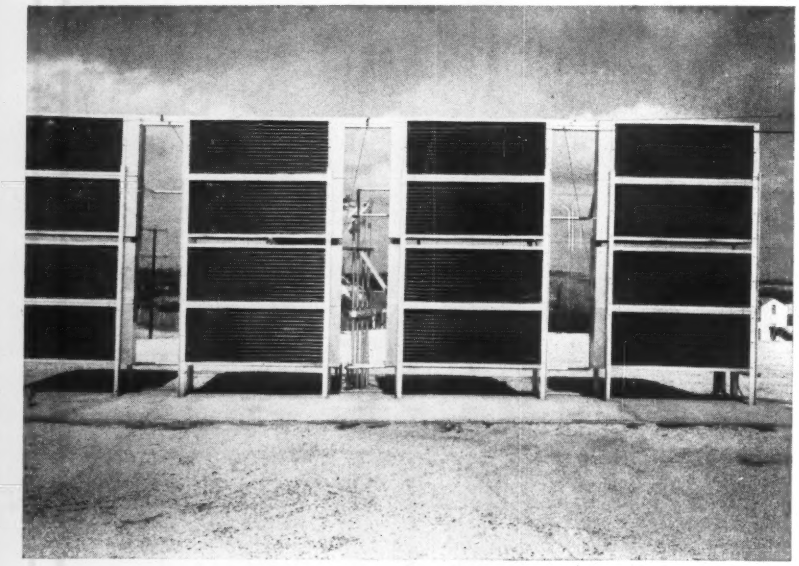
Air-cooled condensers maintain 62½-ton refrigeration load

Air-cooled condensers serving 19 compressors provide 62½ tons of refrigeration for showcases and store rooms at Handy-Andy Community Store No. 2 in San Antonio, Texas.

Five Kramer-Trenton Unicorn condensers, located in the basement, use 13,600 cubic feet of forced ground air per minute. They cool the "Freon-12" refrigerant that protects large and costly stocks of perishables. The 19 Brunner compressors (part of which are shown above) are from ¾ to 5 hp.



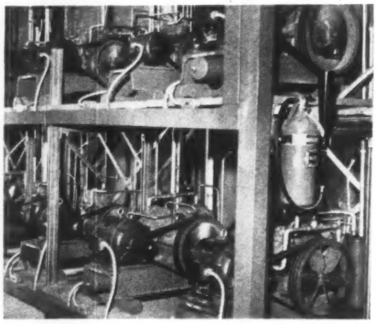
Air conditioning and refrigeration together account for a total of 162½ tons carried by air-cooled condensers at Handy-Andy. Advantages reported for this method of cooling refrigerants include savings in condenser descalation costs, and conservation of public water supplies in a rapidly growing community.



100-ton system with air-cooled condensers cools San Antonio supermarket

Roof-mounted condensers (above) cool "Freon-12" refrigerant in the 100-ton air conditioning system at Handy-Andy Community Store No. 2, San Antonio, Texas.

Fans draw 27,200 cubic feet of air per minute through the Kramer-Trenton Unicorn condensers. Compression is supplied by four twin-mounted Brunner units (below, right) in the store's basement. Result is effective air conditioning throughout 43,000 cubic feet of floor space—even when outside temperatures exceed 100°F. The 100-ton air conditioner is believed to be the nation's largest single installation using air-cooled condensers.



To Handy-Andy management, important maintenance advantages of the air cooling method is the saving in condenser descalation costs. Equally important to a center of growing population like San Antonio: such condensers place no added burden on public water supplies.

You can specify a FREON refrigerant for any air conditioning or refrigeration application

Effectiveness of air conditioning and refrigeration at Handy-Andy is due in part to the charge of "Freon-12" refrigerant in the cooling system. No component of the cooling system is more important than the refrigerant. That's why you should always specify "Freon" for the jobs you do.

You can be sure "Freon" refrigerants will never give you any trouble from acids or moisture. "Freon" refrigerants are safe—nonflammable, nonexplosive, virtually nontoxic. Your wholesaler can promptly supply a "Freon" refrigerant for any size or type of air conditioning or refrigeration application.

For more information or technical data on uses of "Freon", write to E. I. du Pont de Nemours & Co. (Inc.), "Freon" Products Division, #78, Wilmington 98, Del.

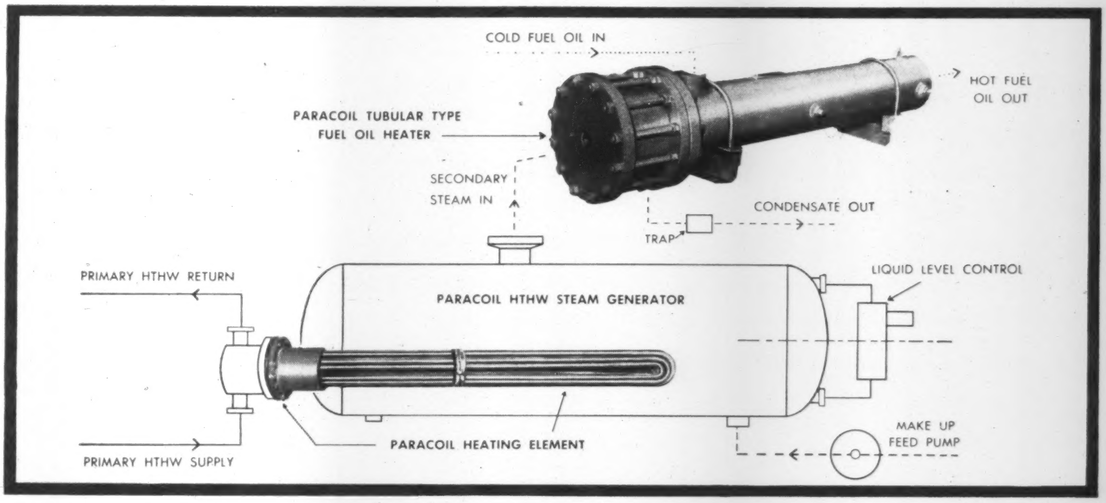
FREON® REFRIGERANTS

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

**Freon and combinations of Freon- or F- followed by numerals are Du Pont's registered trademarks for its fluorinated hydrocarbon refrigerants.*

CUT ALONG DOTTED LINE AND SAVE

Idea no. 1 from **Paracoil**


COLD FUEL OIL IN
HOT FUEL OIL OUT
PARACOIL TUBULAR TYPE FUEL OIL HEATER
SECONDARY STEAM IN
CONDENSATE OUT
TRAP
PRIMARY HTHW RETURN
LIQUID LEVEL CONTROL
PARACOIL HTHW STEAM GENERATOR
MAKE UP FEED PUMP
PARACOIL HEATING ELEMENT
PRIMARY HTHW SUPPLY

How to use secondary steam to pre-heat no.6 oil in a High Temperature Hot Water system

Paracoil engineers know that the first consideration in the design of an oil preheating system for an HTHW installation must be absolute freedom from the possibility of oil leak contamination of the main HTHW stream. A completely isolated oil preheater circuit is recommended. This can be accomplished by means of a secondary heat transfer circuit that does the actual heating. In this way, only the secondary circuit is exposed to possible contamination — the main HTHW circuit is protected at all times.

One of the ways that this isolation is achieved is illustrated above. Additional isolation circuits will be commented upon in future "Idea Sheets". Watch for them!

How to design a protective circuit

1. **Install a steam generator.** Use a Paracoil Heating Element with the HTHW main energy stream as its heat source. With water at 350° F, steam at 25 psig (267° F) can be easily generated in an economically sized unit.
2. **Use the steam thus generated** . . . to heat the fuel oil in a Paracoil Tubular Oil-Type Fuel Oil Heater.* This type heater provides the highest rate of heat transfer — more than **three times** that of the conventional straight tube type.
3. **The condensate from the oil heater** . . . may be returned to the steam generator or sent to waste depending upon plant policy. If the re-use of the condensate is important, absolute surety of its quality can be obtained through the use of the Paracoil Oil Leak Condensate Inspection System.*

Paracoil engineers have designed and built many oil preheater protective systems for both stationary and marine installations. They now offer their experience and know-how to all who are involved in HTHW activities. ***Write for complete data.***

DAVIS ENGINEERING CORPORATION

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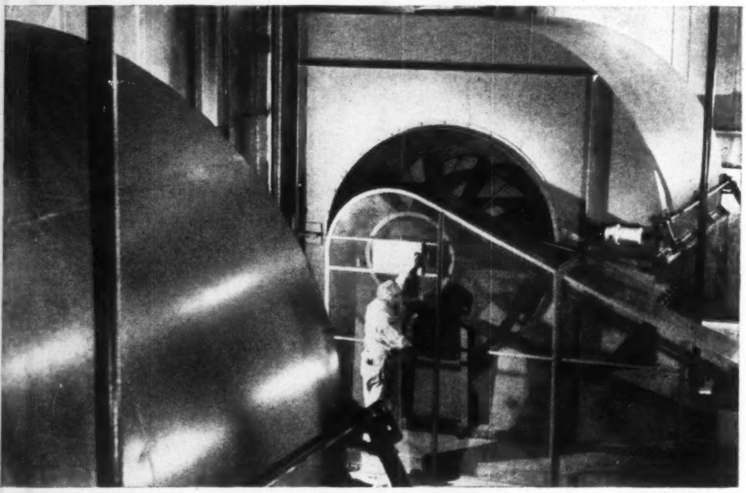
1000 TON CAPACITY PLANT

...air conditions Des Moines newspaper building. 375,000 c.f.m. air circulation!



Two huge Chicago Blower centrifugal airfoil fans handle 375,000 c.f.m. of air in supplying cool, conditioned air throughout the newspaper plant and office areas. Special "Chicago" aerodynamic fan blade design keeps noise level at an absolute minimum.

AIR CONDITIONING MILESTONE

DES MOINES—The combination 13- and 4-story Register-Tribune building is the only large newspaper publishing plant to be successfully air conditioned throughout from a single air handling unit.

WIDE TEMPERATURE RANGE

In addition to fitting duct work into an almost impossible structural situation, the engineer was faced with widely varying room temperatures that result from the amazing variety of operations performed in a newspaper plant. Under one roof and in close proximity are hot stereoptyping operations, typesetting, darkroom facilities, wire service functions as well as office areas where humans work feverishly to satisfy the news demands of ever-humming, ever-hungry printing presses.

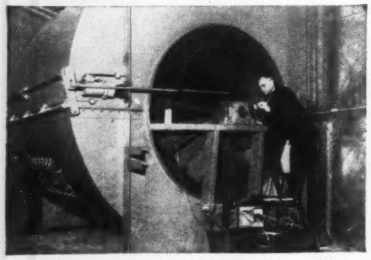
CHICAGO BLOWERS CIRCULATE 375,000 C.F.M. OF AIR THROUGH 1½ MILLION CUBIC FT. AREA

"One of the toughest problems," according to Mr. Wm. E. Nanes, consulting engineer, "was the cool air circulating fans."

"The Register-Tribune people specifically requested the quietest fans available. It turned out that Chicago Blower Corporation could meet our needs on both counts. They had the capacity we wanted and their special hollow-sectioned air foil blade construction made the fans surprisingly quiet."

92% EFFICIENCY WITH LESS POWER

Two Chicago Blower fans, whose housings are 15′ high, were used. Each fan rotor is over 7′ in diameter and weighs 3000 pounds. Because the blades are aerodynamically designed, similar to an airplane wing, eddy currents responsible for turbulence and noise are virtually eliminated. Fan efficiencies are an amazing 92% and they operate on less power. Noise level over similar capacity units is reduced as much as 40%.



Chicago Blower makes it standard procedure to give all large blower installations a final field balancing.

CHICAGO BLOWER ENGINEERING ASSISTANCE ALWAYS AVAILABLE

Chicago Blower plant and field engineers are always on call to assist firms working on heating and ventilating problems. They bring to any job a wealth of time-, trouble-, and money-saving information gained on thousands of installations.

7207

CHICAGO

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Your local Chicago Field Engineer is in the 'Yellow Pages'

Want all the facts about this aerodynamically-designed fan? Ask your "Chicago" field engineer for a copy of Bulletin A-103. You will find him listed under "Fans," "Blowers," or "Ventilating Equipment and Supplies" in the YELLOW PAGES of your phone book. If you prefer, write or call direct and complete information and service will be provided.

the world's only

TOTALLY-PROTECTED MOTOR

When we speak of Totally-Protected, we mean superior frame design with rigidity for heavy load conditions. We mean Metermatic bearing lubrication, acid and oil-proof insulation system, and motor leads, labeled and sealed in neoprene.

Totally-Protected means all this and more, but most of all it means a new concept of motor design and construction.

This Totally-Protected concept brings you a new motor efficiency. These motors have a built-in extra life—an extra life found only in Reliance Totally-Protected A-c. Motors. You profit from less maintenance and more production in your plant.

For more information on this Totally-Protected concept, write to Dept. **368A** for Bulletin B-2401.
(B-1543)

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AND ENGINEERING COMPANY

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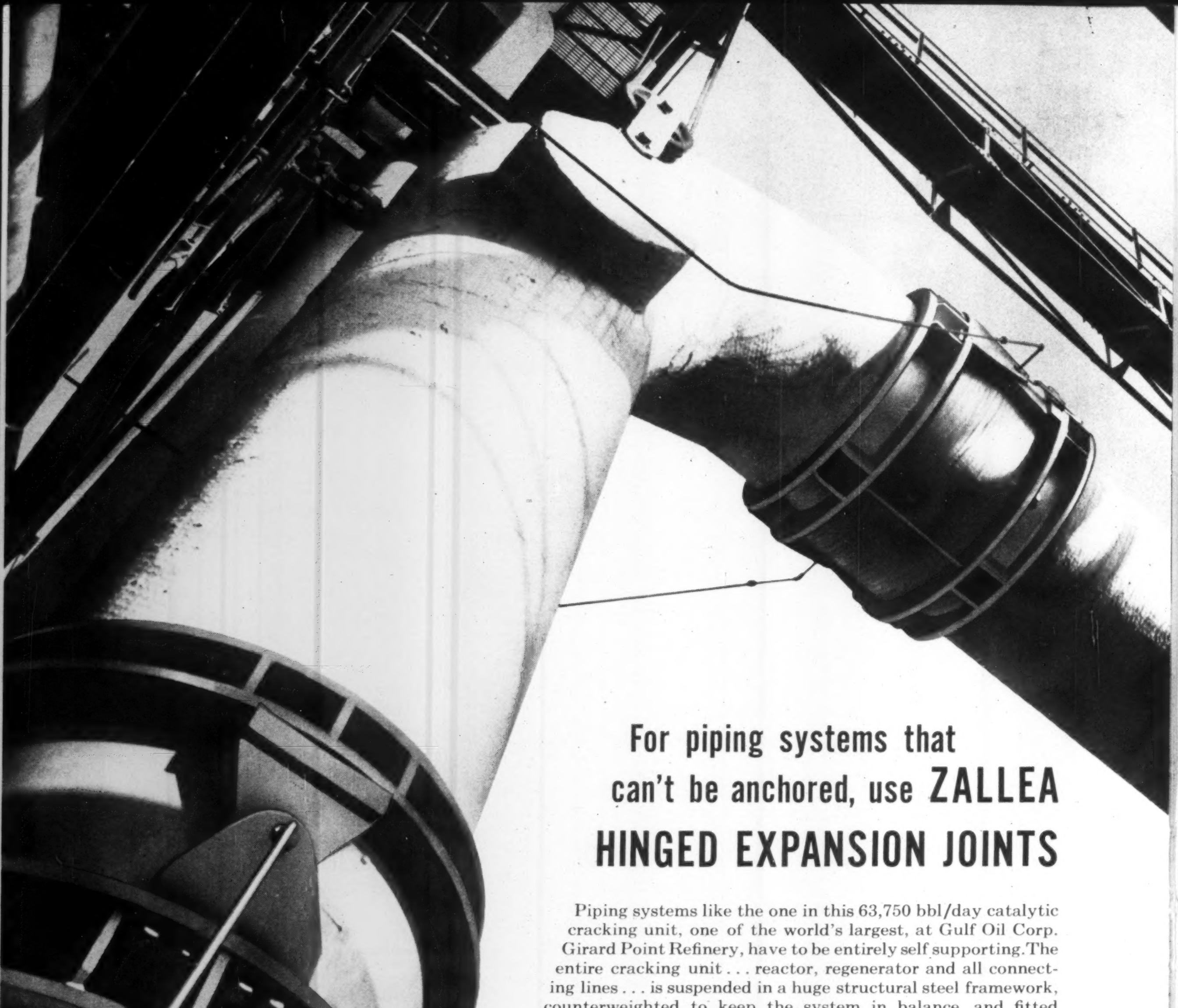


For piping systems that can't be anchored, use ZALLEA HINGED EXPANSION JOINTS

Piping systems like the one in this 63,750 bbl/day catalytic cracking unit, one of the world's largest, at Gulf Oil Corp. Girard Point Refinery, have to be entirely self supporting. The entire cracking unit . . . reactor, regenerator and all connecting lines . . . is suspended in a huge structural steel framework, counterweighted to keep the system in balance, and fitted with Zallea Hinged Expansion Joints to provide vital flexibility plus support for the reactor.

In the 150 ft. air supply line, all thermal movement of the piping is absorbed by angular displacement in three 42″ dia. Zallea Hinged Expansion Joints. Start-up air in this line is at 1000°F. Under operating conditions it is delivered at 250°F, 25 psig.

Two 50″ dia. Zallea Hinged Expansion Joints in the spent catalyst line carry fluidized cracking catalyst at 950°F, 13 psig.

Since this cracking unit first went on stream, these Zallea Expansion Joints have given completely trouble-free service.

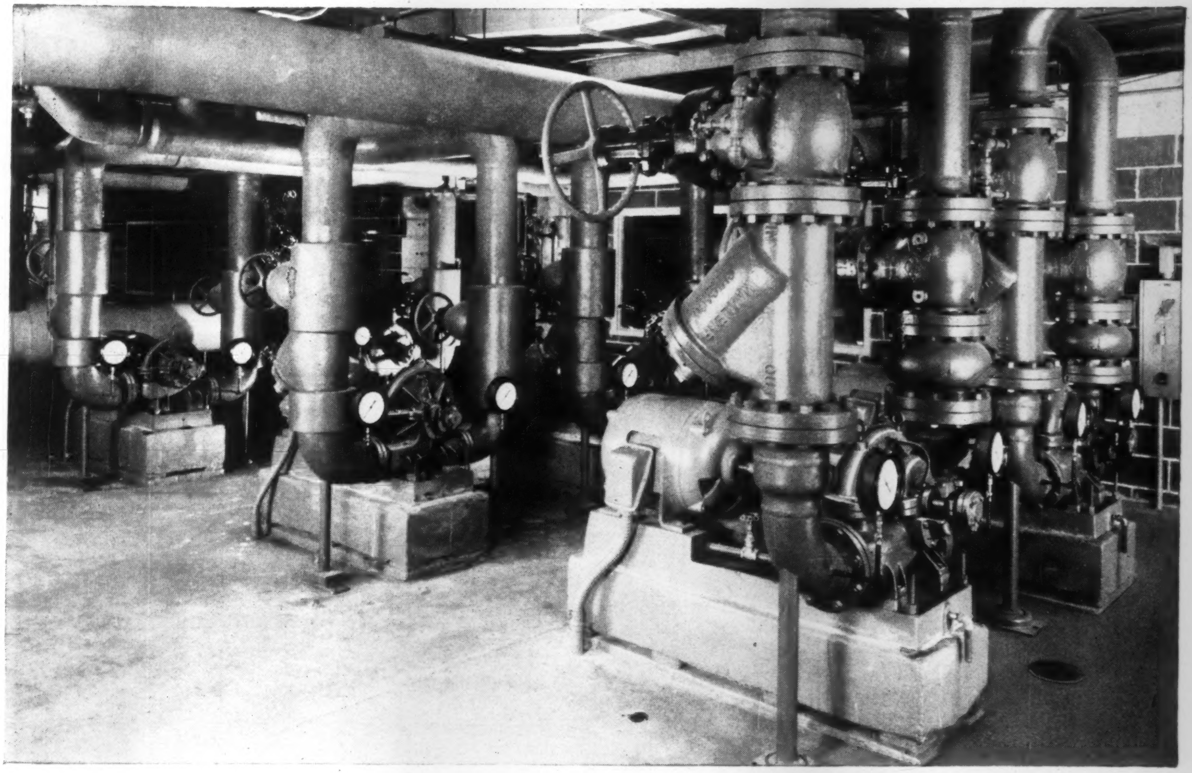
Process piping of any kind can be fully protected with one or more Zallea Expansion Joints. From the complete Zallea line you can select the expansion joint or combination of expansion joints best suited to your particular problems.

Get the complete story in our new 72-page manual. Write today, on your company letterhead, for your copy of Catalog 56. Zallea Brothers, 816 Locust Street, Wilmington 99, Delaware.

Zallea *expansion joints*

Zallea Brothers • Wilmington 99, Delaware

World's largest manufacturers of expansion joints



How do you guarantee successful pump installations?

Many rely on these "Buffalo" Pumps

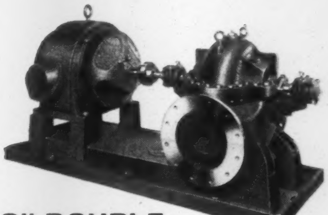
There's a "Buffalo" Pump that's sure to fit your installation needs perfectly . . . sure to deliver the utmost in economy, reliability and long-lasting performance on the job. For *two* reasons: *First* . . . "Buffalo" builds a line of pumps covering almost every type of liquid-moving requirement. All you do is select the *one* "Buffalo" Pump that exactly matches your installation needs. *Second* . . . When you choose your "Buffalo" Pump, you can be sure you're installing the very finest. For more than 80 years, engineers and contractors have relied on the rugged, dependable quality built into every "Buffalo" Pump. You can *depend* on "Buffalo" Pumps.

Whatever your pump problem, write us for engineering data. We'll gladly submit recommendations that will help you with your liquid-moving requirements.

"Buffalo" PUMPS

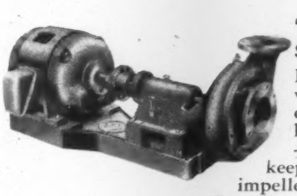
BUFFALO PUMPS
Division of Buffalo Forge Co.
171 Mortimer St. Buffalo, N.Y.
Canada Pumps, Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID



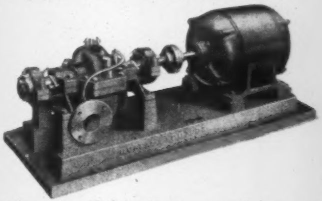
"BUFFALO" DOUBLE SUCTION PUMPS

These pumps are designed for the finest performance possible in clear water service in 10 to 14,000 gpm capacities. Widely used for air conditioning service, because of their peak efficiency. Write for Bulletin 955-Q.



"BUFFALO" SINGLE SUCTION PUMPS

Husky pumps for husky jobs, with these outstanding features: oversize bearings capable of handling speeds up to 5000 rpm — sealed-in bearing housing to keep out foreign matter — enclosed impellers, to retain initial efficiency. Complete details in Bulletin 976-E.



"BUFFALO" MULTISTAGE PUMPS

"Buffalo" Type "RR" Multistage Pumps are highly efficient for high pressure applications with clear water. Ideal for boiler feed service. Available in two and four stage designs, up to 900 gpm and 500 lbs. Write for Bulletin 980-D.

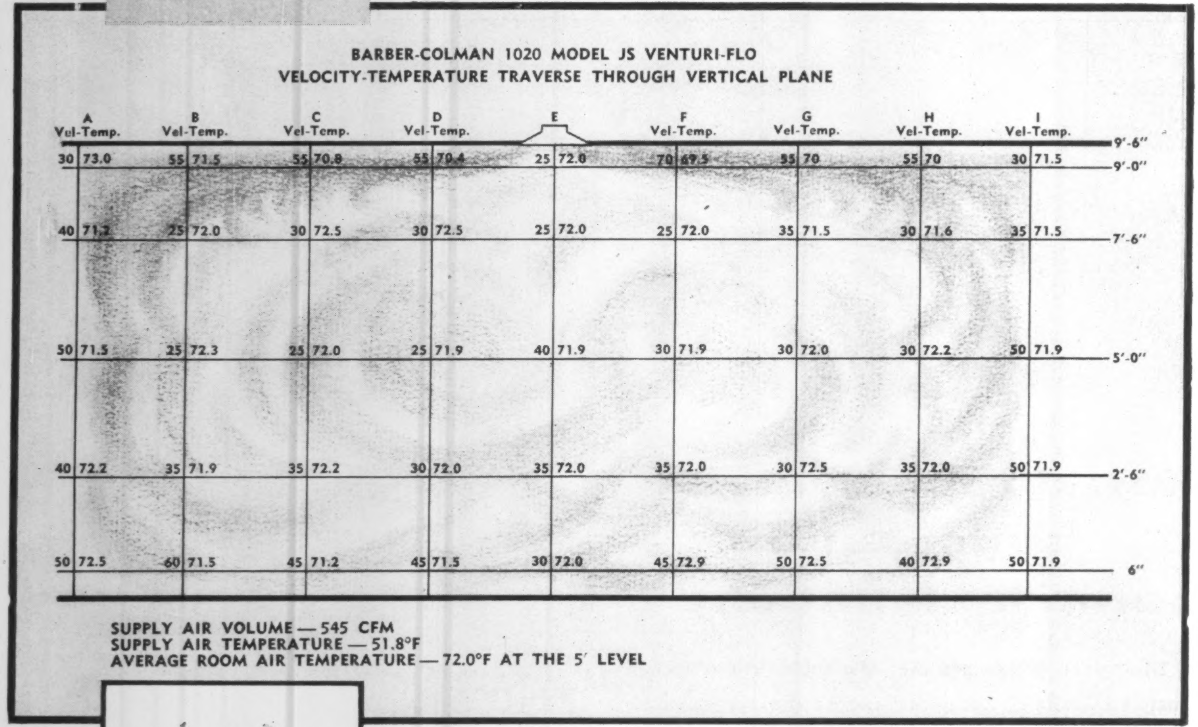
THE MARK OF QUALITY

BARBER COLMAN

Uni-Flo

ENGINEERED AIR DISTRIBUTION

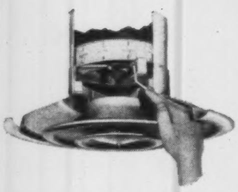
get guaranteed performance with Venturi-Flo ceiling diffusers



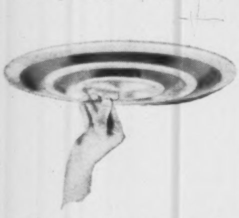
BARBER-COLMAN 1020 MODEL JS VENTURI-FLO
VELOCITY-TEMPERATURE TRAVERSE THROUGH VERTICAL PLANE

A Vel-Temp.	B Vel-Temp.	C Vel-Temp.	D Vel-Temp.	E	F Vel-Temp.	G Vel-Temp.	H Vel-Temp.	I Vel-Temp.	
									9'-6"
30 73.0	55 71.5	55 70.8	55 70.4	25 72.0	70 69.5	55 70	55 70	30 71.5	9'-0"
40 71.2	25 72.0	30 72.5	30 72.5	25 72.0	25 72.0	35 71.5	30 71.6	35 71.5	7'-6"
50 71.5	25 72.3	25 72.0	25 71.9	40 71.9	30 71.9	30 72.0	30 72.2	50 71.9	5'-0"
40 72.2	35 71.9	35 72.2	30 72.0	35 72.0	35 72.0	30 72.5	35 72.0	50 71.9	2'-6"
50 72.5	60 71.5	45 71.2	45 71.5	30 72.0	45 72.9	50 72.5	40 72.9	50 71.9	6"

SUPPLY AIR VOLUME — 545 CFM
SUPPLY AIR TEMPERATURE — 51.8°F
AVERAGE ROOM AIR TEMPERATURE — 72.0°F AT THE 5′ LEVEL



Opposed-blade volume control is easily operated through face of diffuser.



Simple adjustment provides air patterns from horizontal to vertical.

The uniform, draft-free air distribution pattern charted above is typical of the results you can predict with Venturi-Flo ceiling diffusers. With Venturi-Flo, the mixing of primary air with room air takes place throughout the entire length of the throw. This permits even higher temperature differentials than shown in the traverse above. Barber-Colman guarantees performance of Venturi-Flo ceiling diffusers when they are used according to published data. Contact your nearby Barber-Colman field office or write for complete information. Remember . . . only Barber-Colman combines skills in both air distribution and automatic temperature controls for undivided responsibility.

BARBER-COLMAN COMPANY

Dept. T, 1101 Rock Street, Rockford, Illinois

CLIP AND POST!

You'll find this advertisement a convenient reference. Clip it now, and post on your shop wall.

Pressure Temperature Chart

Vapor Pressure—psig

Red Figures= inches of mercury vacuum

Temp. °F	genetron 11	genetron 12	genetron 22	genetron 113	Temp. °F	genetron 11	genetron 12	genetron 22	genetron 113
—50	28.9	15.4	6.0		55	9.9	52.0	93.3	22.0
—45	28.7	13.3	2.6		60	7.7	57.7	102.5	21.0
—40	28.4	11.0	0.6		65	5.3	63.8	112.2	19.9
—35	28.1	8.4	2.7		70	2.6	70.2	122.5	18.7
—30	27.8	5.5	5.0	29.3	75	.1	77.0	133.4	17.3
—25	27.4	2.3	7.6	29.2	80	1.6	84.2	145.0	15.9
—20	27.0	0.6	10.3	29.1	85	3.2	91.8	157.2	14.3
—15	26.5	2.4	13.3	28.9	90	5.0	99.8	170.1	12.5
—10	26.0	4.5	16.6	28.7	95	6.9	108.3	183.7	10.6
—5	25.4	6.7	20.2	28.5	100	8.9	117.2	197.9	8.6
0	24.7	9.2	24.1	28.2	105	11.1	126.6	212.9	6.4
5	24.0	11.8	28.3	27.9	110	13.4	136.4	228.7	4.0
10	23.1	14.6	32.9	27.6	115	15.9	146.8	245.3	1.4
15	22.1	17.7	37.9	27.2	120	18.5	157.7	262.6	0.7
20	21.1	21.0	43.3	26.8	125	21.3	169.1		2.2
25	19.9	24.6	49.0	26.3	130	24.3	181.0		3.7
30	18.6	28.5	55.2	25.8	135	27.5	193.5		5.4
35	17.2	32.6	61.9	25.2	140	30.8	206.6		7.2
40	15.6	37.0	69.0	24.5	145	34.4	220.3		9.2
45	13.9	41.7	76.6	23.8	150	38.2	234.6		11.2
50	12.0	46.7	84.7	22.9					

genetron®

super-dry refrigerants

There's a "Genetron" Super-Dry Refrigerant for your every need. They're available everywhere—*see your wholesaler!*

genetron 11	ORANGE LABEL	TRICHLOROMONOFLUOROMETHANE
genetron 12	WHITE LABEL	DICHLORODIFLUOROMETHANE
genetron 22	GREEN LABEL	MONOCHLORODIFLUOROMETHANE
genetron 113	PURPLE LABEL	TRICHLOROTRIFLUOROETHANE
genetron 114A	DARK BLUE LABEL	DICHLOROTETRAFLUOROETHANE

HANDY POCKET SIZE, TOO!

The "Genetron" pressure temperature chart above is also available—free—as a handy pocket-size plastic card, for ready reference on the job. Ask your "Genetron" wholesaler for *yours.*

genetron department

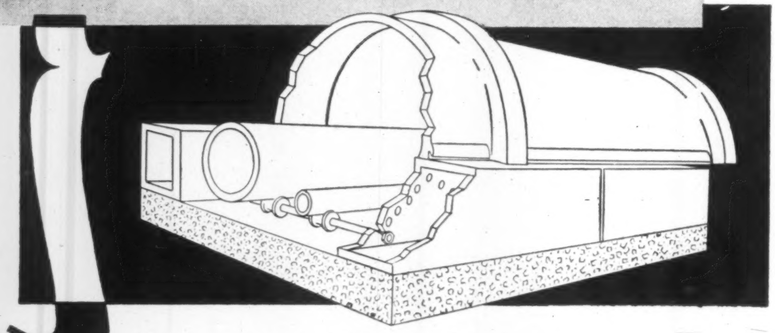
GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

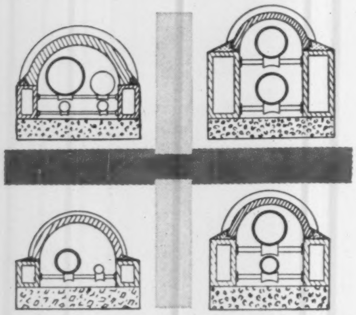
PERMANENT PROTECTION for underground piping!

STILLWATER CERT-A-BAR* TUNNEL CONDUIT SYSTEM



New ceramic Cert-A-Bar Pipe Support Blocks eliminate the need for interior cast iron rests. The perforated block is laid as a structural support member at regular intervals, and the bars are simply inserted and locked in place.

The vital consideration in selecting an underground conduit system is *permanent* protection . . . not for one year or five, *but for the life of the piping*. You get the best possible protection for your underground metal service piping with a Stillwater Conduit System of vitrified clay. It's chemically inert—can't rust, rot, corrode, or decay . . . ever. And it is manufactured in accordance with ASTM specification C-13-54, assuring proper strength and quality. Any combination of service piping can be protected. Conduit is available in a wide range of sizes, with a complete line of fittings and accessories, including alignment guides, lateral guides, and anchors. Any contractor's crew can handle the installation easily, or if you prefer, Stillwater Licensed Installers will assume the responsibility. The Cert-A-Bar Tunnel System can be installed with any of three suggested new waterproofing specifications —one for average conditions, one for intermittent ground water conditions, and a third for high water table conditions. It's the lowest-cost conduit per year of service that you can specify or install!



THE CERT-A-BAR SYSTEM HAS ALL THESE IMPORTANT ADVANTAGES

- Inherent structural strength for permanent protection
- Complete flexibility for design
- Minimum initial and long-term costs
- Quickly installed
- Keeps pipe insulation dry
- No electrolytic corrosion of piping
- No maintenance required

A few of the hundreds of possible combinations of piping for the Cert-A-Bar Tunnel System are shown at left.

WRITE FOR

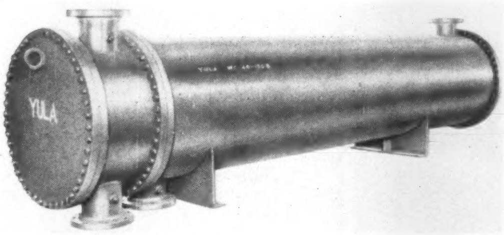
illustrated, four-page circular with complete installation specifications.

*T.M. Reg. App. For.
Patents Pending

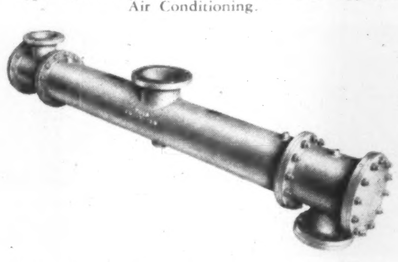
The Stillwater Clay Products Co.
STILLWATER CONDUIT DIVISION
3334C Prospect Avenue, Cleveland 15, Ohio

STILLWATER
CONDUIT
SYSTEMS

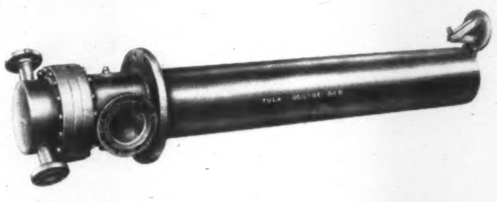
Full Floating Head Exchanger.



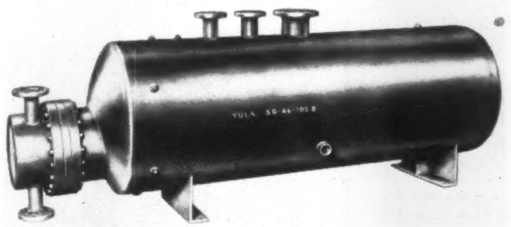
Channel Type Interchanger — for water-to-water application in Air Conditioning.



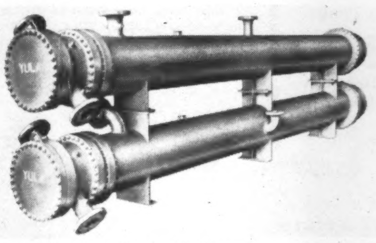
Straight Tube Channel Type Convertor — for Heating, Zone Systems, Snow Melting where either steam or water is the heating medium.



Oil Tank Suction Heater with Check Valve.



Unfired High Temperature Hot Water Steam Generator.



High Pressure Floating Head Oil Heaters — for Power Plant Application.

Yula

a complete line of heat transfer equipment or every application

Our organization is experienced in the design and fabrication of heat exchangers for commercial, process, chemical, refinery and marine requirements. In addition, we have made a specialty of the application of High Temperature Hot Water as a heating medium through the use of transfer equipment. We are still old fashioned in one respect: that a satisfied customer is valuable. Because of this belief, we offer; quality, fine workmanship, excellent service, free engineering consultation and fair prices. Our shop is A.S.M.E. certified for materials commonly used in fabrication.

. . . here is your

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Mechanical Products Co.—702 Jefferson Rd., S. Charleston, W. Va.

Mec-Tric Control Co.—P. O. Box 209, Charlotte 1, N. C.

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Mr. William O'Keefe—162 Brevator St., Albany, N. Y.

Power Specialty Co.—463 Chestnut St., Nashville 10, Tenn.

J. Daniel Rupert Co.—P. O. Box 112, Kalamazoo, Mich.

Ralph Simmons Co.—73 La Salle Ave., Kenmore 17, N. Y.

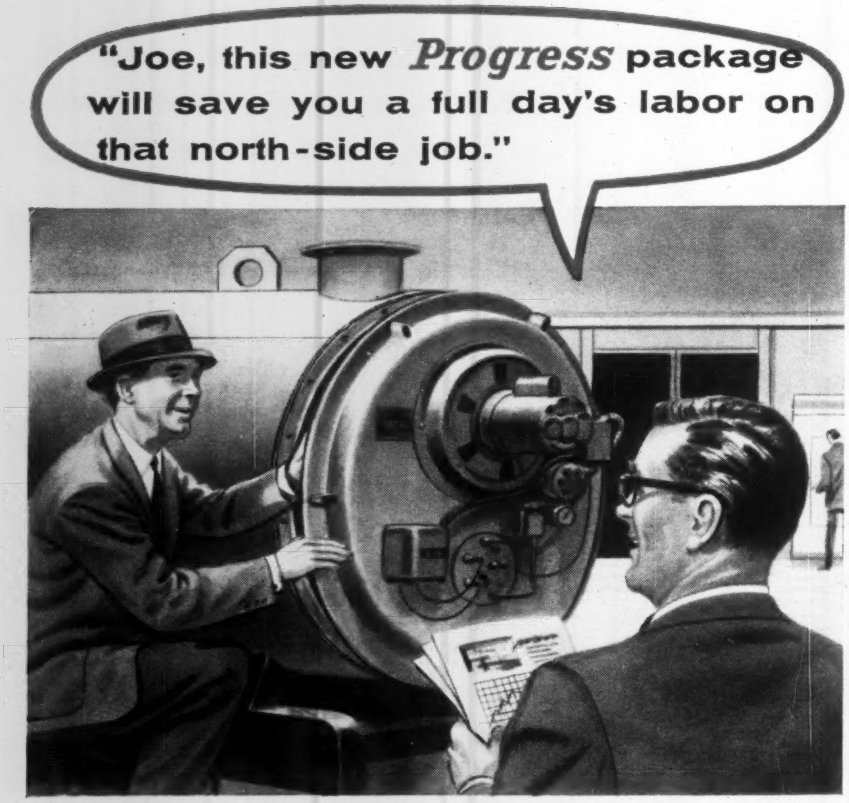
Tennessee Heating Sales—P. O. Box 391, Knoxville, Tenn.

Mr. Bernard A. Thomas—2925 W. Hillsborough Ave., Tampa 3, Fla.

YULA WATER HEATERS, INC.

330 BRYANT AVENUE, NEW YORK 59, N.Y.

MEMBER FUEL OIL AND WATER HEATER MANUFACTURERS ASSOCIATION

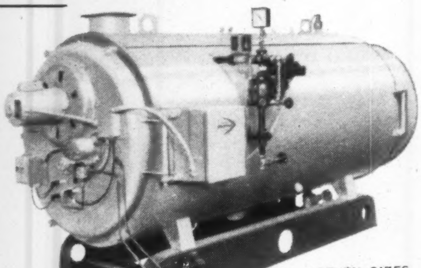

"Joe, this new *Progress* package will save you a full day's labor on that north-side job."

Wholesalers, contractors agree: *Progress* package ends profitless "scatter-buying"* because it's a complete boiler

Now, for the first time in the commercial heating field — Cleaver-Brooks brings you a boiler that effectively simplifies planning, purchase and installation! The new Progress package earns more profit for you because substantial installation time (at least a full day or more) is saved on *every* job.

Progress is a fully fire-tested boiler, ready to operate after connections to service lines. You buy from *one* responsible manufacturer. Warranties are backed by Cleaver-Brooks, the best-known name in packaged boilers. You sell unmatched performance and efficiency at a greater profit. Ask your wholesaler for detailed proof in a fair comparison with built-up jobs.

**Time and profits wasted in planning, buying, and installing individual boiler components.*



SEVEN SIZES
Up to 2,000,000
Btu output. Steam or hot water, gas or oil fired. Sold through selected wholesalers only.

Shipped direct to the job — ready for immediate installation. Base frame sets solidly on any floor. Cleaver-Brooks starting service representative places boiler in operation and trains attendant at no extra charge.

Contractors, engineers, architects, users — write NOW for full details on America's most modern boiler — in step with progress . . . way ahead in design. Ask for catalog AD-157.

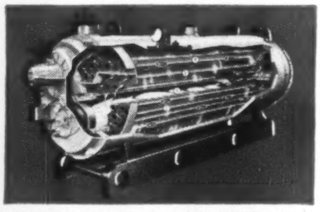
Cleaver-Brooks
Progress
Packaged Boiler

Progress boiler sets new standards in silent operation

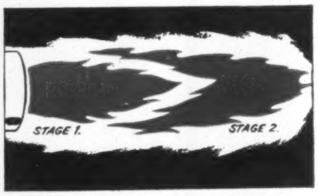
Has noise been a problem in your installations? Progress completely eliminates this complaint. At peak load it more than meets the low sound levels required for schools, hospitals and other buildings.

An exclusive type of caseless fan draws combustion air into the large plenum chamber of the front head. It completely confines and deadens fan and air noises.

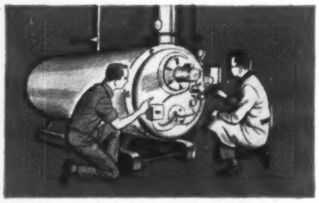
Progress boilers are products of Cleaver-Brooks Company, originators of packaged boilers — the first boilers of their class built to the quality standards of costly industrial boilers.



PROGRESS BOILER IS COMPLETELY INTEGRATED — boiler, burner, controls and insulation. Four-pass, forced-draft design, electronic controls, clean-burning, quiet operation with guaranteed 80% thermal efficiency.



SOFT FLAME START assures smooth ignition. You get distinctive two-stage burner light-off. The gradual-opening diaphragm valve and positive electric-gas pilot ignition assure clean, quiet light-offs.



FACTORY INSPECTED AND TESTED — In addition to certification by insurance inspectors covering conformity to A.S.M.E. code, Progress boilers are pre-tested by actual firing. All electrical equipment conforms to the National Electric Code.

CLEAVER-BROOKS COMPANY

DEPT. J, 313 E. KEEFE AVENUE
MILWAUKEE 12, WISCONSIN

groping for a source of stainless steel pipe?

CALL YOUR REPUBLIC ELECTRUNITE DISTRIBUTOR

His service in all of your stainless steel pipe and tubing problems stands out like a beacon. Just describe your job and look no further. He will ship the sizes and analyses you need without delay.

For example, he carries Republic ELECTRUNITE® Stainless Steel Pipe in Types 304, 304-L, 316, 316-L, 321 and 347—plus other analyses. Continuous welded sizes from ⅛″ I.P.S. through 2″ I.P.S. in A.S.A. schedule 40S; from ⅛″ I.P.S. through 4″ I.P.S. in schedule 10S; and from ½″ I.P.S. through 4″ I.P.S. in schedule 5S wall thicknesses. Larger sizes up to 30″ also available. In addition, he handles all sizes and analyses of Republic Stainless Steel Tubing.

No special guidance is needed to join Republic ELECTRUNITE Stainless Steel Pipe. Depending on your application, it can be welded or coupled with threaded or compression fittings. Identification is a stainless pipe cinch, too. Republic ELECTRUNITE is clearly stenciled throughout each length, along with type, heat number, and specification. Regardless of where it's cut, identification remains positive.

To end your search for quality stainless steel pipe and tubing, contact your Republic ELECTRUNITE distributor. He's a good man to know—and anxious to serve you. Or for complete information, mail coupon.

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Metals, Inc., Bristol
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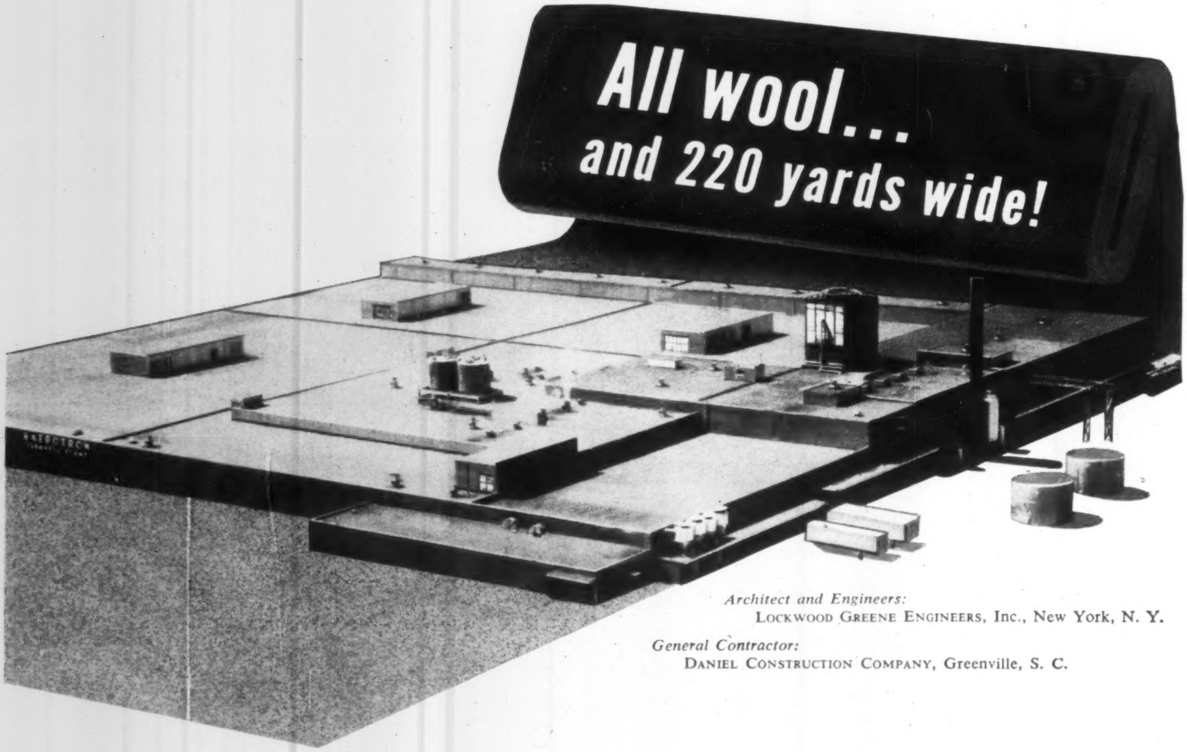


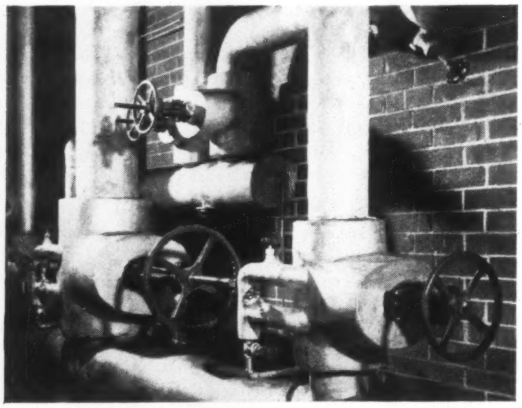
Architect and Engineers:
LOCKWOOD GREENE ENGINEERS, Inc., New York, N. Y.
General Contractor:
DANIEL CONSTRUCTION COMPANY, Greenville, S. C.

Textron's first fully integrated woolen mill is equipped with **JENKINS VALVES**

The nation's largest woolen mill, with weaving, dyeing and finishing facilities all under one roof, occupies 430,000 square feet at Barnwell, S. C. This huge plant, operated by Amerotron Corporation, a Textron company, contains the most modern equipment that textile technology and modern engineering could provide. Utilizing U-shaped production flow, the Barnwell Mill achieves the utmost in economy of movement and handling of raw and finished materials.

The equipment for this ultra-modern, air conditioned plant was selected to match the efficiency and advanced concept of the building design. To control much of the complex piping system, Jenkins Valves were the unanimous choice of Textron's management and the engineers and contractor involved in this project.

Expectation of an extra measure of performance and economic service from Jenkins Valves has been universal among building experts and plant operating personnel for three generations. The symbol of this reputation is the famous Jenkins' Diamond and Signature trade-mark . . . and, moreover, the valves that bear it *cost no more.* Jenkins Bros., 100 Park Avenue, New York 17, N. Y.



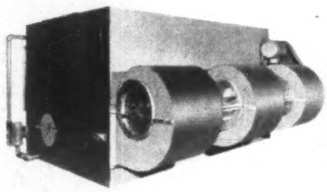
Example of the wide variety of sizes and types of Jenkins Valves required to control the complex piping system of Textron's new Barnwell Mill.

JENKINS
LOOK FOR THE JENKINS DIAMOND
TRADE JENKINS MARK SINCE 1864
VALVES
Jenkins Bros

Sold Through Leading Distributors Everywhere

EQUIPMENT DEVELOPMENTS...

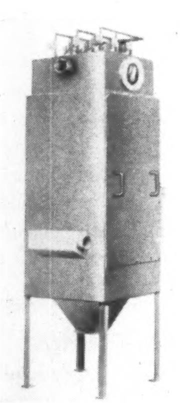
For reviews of Recent Trade Literature see Page 238



Evaporative Condensers . .

. . . in two new lines, both suitable for fluorinated hydrocarbon refrigerant or ammonia—*Vilter Mfg. Co., Dept. HPAC, 2148 S. First St., Milwaukee 7.*

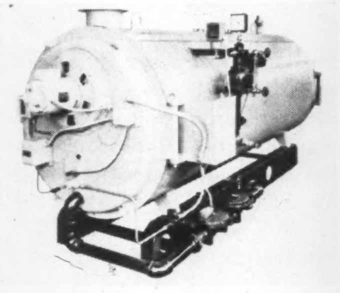
"VXF" (external fan) unit available in capacities 30 to 300 nominal tons. Since fan is externally mounted, it does not handle moist saturated air from spray chamber, says company. Is said to minimize corrosion, extend fan life. Designed for outdoor service, although can be used indoors with modifications. Shown is "VXF" rated 175 tons. Other line, "VSC" (standard condenser), engineered primarily for indoor use. In capacities 50 to 300 nominal tons.



Dust Collector . . .

. . . with no internal moving parts, minimum maintenance — *Pulverizing Machinery Div., Metals Disintegrating Co., Inc., Dept. HPAC, Chatham Rd., Summit, N. J.*

"Mikro-Pulsaire" consists of varied numbers of cylindrical filter elements which are 4 or 6 ft long enclosed in "dust-tight" housing. Dust laden air admitted into housing through side inlet. Cleaned air withdrawn from inside of filter-elements with air circulating system. Most dust goes from inlet down to bottom discharge of housing. Balance of dust is retained on outside surfaces of filter elements. Filters cleaned by introducing jet of high pressure air through specially contoured venturi mounted above each filter cylinder, says company. Collectors available with 9, 20, 30, 48 filter tubes. Capacities range 400 to 5000 cfm.



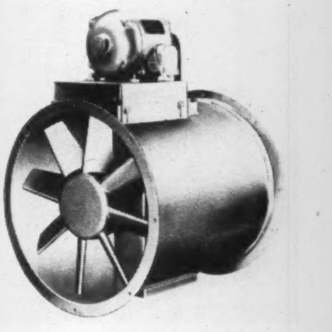
Packaged Boilers . . .

. . . in 50, 60 hp models—*Cleaver-Brooks Co., Dept. HPAC, 326 E. Keefe Ave., Milwaukee 12.*

Units are extension of manufacturer's "Progress" packaged boiler line. Designed for schools, churches, motels, apartment houses, stores, similar buildings. Forced draft system combined with four-pass design provides advantages of high heat transfer, controlled combustion, low stack temperatures, says company.

Belt Driven Duct Fan . . .

. . . designed to operate under corrosive atmospheric, extreme temperature conditions — *Chicago Blower Corp., Dept. HPAC, 9863 Pacific Ave., Franklin Park, Ill.*



"BD" incorporates new concept in blade design which produces higher pressure characteristic while reducing noise to minimum, says company. For temperatures to 150 F. Special models available for 650 F. With 2, 4, 6, 8 bladed steel or aluminum wheels. In sizes 12 to 72 in.

Air Conditioning Unit. . .

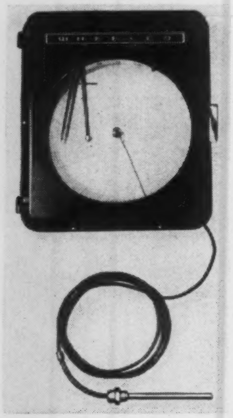
. . . for apartments, hotels, schools, commercial installations — *Plumbing and Heating Div. of American-Standard, Dept. HPAC, 40 W. 40th St., New York 18.*

"Vertical Remotaire" engineered to provide efficient year 'round comfort in least amount of usable space. In four sizes, all with 9 in. depth, 25 in. height. In three models: free standing, recessed, recessed with outdoor air intake. For use in centrally located hot water heater and chiller cooling system.

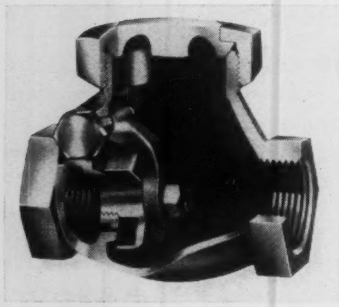
Thermometers . . .

. . . in new series including recorders, recorder-controllers, indicators, indicator-controllers—*Wheelco Instruments Div., Barber-Colman Co., Dept. HPAC, Rockford, Ill.*

"4000 Series" recorders and recorder-controllers use 12 in. charts.



Use mercury-actuated sensing elements for uniform accuracy over entire scale, says company. Recorder-controllers available in variety of control forms, use plug-in type control chassis. Indicators and indicator-controllers available in same control forms as round chart recorder-controllers. Temperature range of series is −40 to 950 F. Available as surface or flush mounted units.



Swing Check Valve . . .

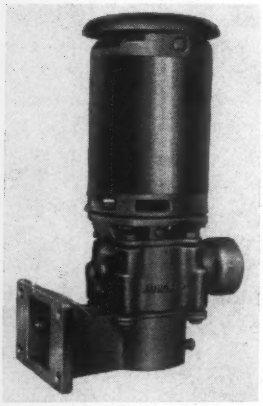
. . . with renewable composition disc — *Fairbanks Co., Dept. HPAC,* 393 *Lafayette St., New York* 3.

Recommended by company for service on liquid lines where full unobstructed flow or minimum resistance to flow is desired. Renewable discs protect valve seat from damage due to solid particles in steam, shocks of pulsating pressures, says company. Discs replaced without removing valve body from line. "Fig. 0630" units rated 150 lb steam and 300 lb cold water, oil or gas. In sizes ½ to 2 in.

Packaged Conditioners . . .

. . . for use with remote air cooled condensers — *Trane Co., Dept. HPAC, La Crosse, Wis.*

Available in 3, 5, 7½, 10, 15 hp capacities. Recommended by company for use in areas where water is scarce or local ordinances restrict use of water for air conditioning. With capped connections for discharge and liquid lines, smaller 3, 5, 7½ hp sizes use single condenser. Larger units equipped for use with two remote condenser models.



General Purpose Pumps . .

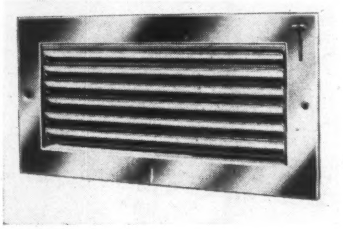
. . . in horizontal, close coupled horizontal, pedestal mounted, flange mounted vertical, base mounted vertical models — *Aurora Pump Div., New York Air Brake Co., Dept. HPAC,* 80 *Loucks St., Aurora, Ill.*

In range of sizes 1/6 to 7 ½ hp at speeds 1750 to 3500 rpm, a-c or d-c, all voltages and phases, says company. Cited applications: circulation of liquids in air conditioning, refrigeration, coolant, hot water, chemical, general purpose applications.

Air Conditioner . . .

. . . for built-in-wall installation— *I.W. Air Conditioning Corp., Dept. HPAC,* 230 *Manida St., New York.*

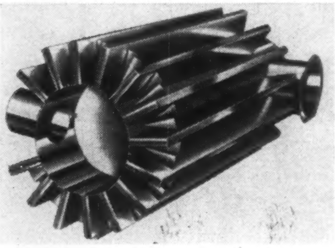
Designed to blend with any type of convector heating unit in single, harmonious plane. Is said to be smaller and slimmer, yet quieter and faster cooling. Recommended by company for apartment houses, hotels, motels, office buildings. In ¾, 1, 1½ ton sizes.



Grilles . . .

. . . designed to lower cost of "converting to air conditioning" jobs, provide correct air patterns for both winter heating and summer cooling —*Titus Mfg. Corp., Dept. HPAC, Waterloo, Iowa.*

"Converti-Grilles" applicable to small commercial installations. Are quickly, easily installed, says company. Slipped in place of stamped registers. Are said to eliminate expensive ductwork changes. In three standard sizes: 10 × 6, 12 × 6, 14 × 6 in. Also available with ⅞ in. projection flange for baseboard installations.



Heat Exchanger . . .

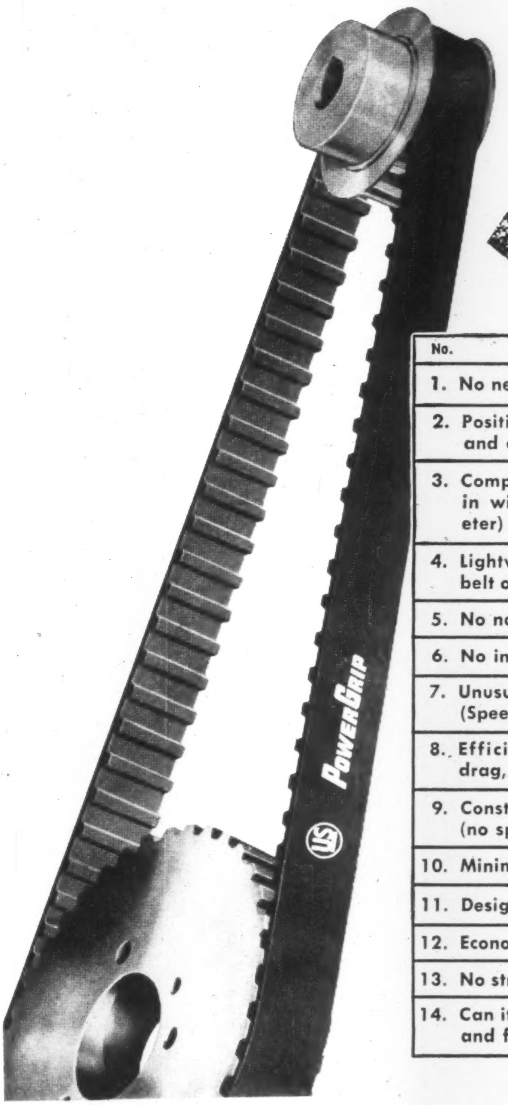
. . . designed for high efficiency— *Lennox Industries, Inc., Dept. HPAC, Marshalltown, Iowa.*

Efficiency achieved through use of unusual finned design, says company. Combustion gases are forced through long thin fins which transfer heat to recirculated air. Turbulators designed to make air "scrub" fins to pick up maximum amount of heat.

Zirconium Fittings . . .

. . . for nuclear energy application — *Tube Turns, Div. of National Cylinder Gas Co., Dept. HPAC,* 224 *E. Broadway, Louisville* 1.

With 1.5 in. OD, 0.065 in. wall. Recommended by company for use where severe corrosion conditions are met. Designed to have very low ther-



"✓" in your transmission belt needs

No.	Advantages	PowerGrip "Timing" Belt	Chain	Gear	V-Belts	Flat Belts
1.	No need for lubrication	✓				
2.	Positive elimination of slip and creep	✓				
3.	Completely compact (Both in width and pulley diameter)	✓				
4.	Lightweight (Heavy duty belt only 0.1 lb./ft./in.)	✓				
5.	No noise or vibration	✓				
6.	No initial tension	✓				
7.	Unusual speed range (Speeds up to 12,000 FPM)	✓				
8.	Efficient (Elim. heat, lube drag, high bearing loads)	✓				
9.	Constant angular velocity (no speed fluctuation)	✓				
10.	Minimum backlash	✓				
11.	Design flexibility	✓				
12.	Economical	✓				
13.	No stretch	✓				
14.	Can it be completely housed and forgotten?	✓				

Note that the U. S. PowerGrip "Timing" Belt takes a "✓" after every advantage

While every type of drive has certain advantages, *no* type of power transmission possesses *so many* advantages as the U.S. PowerGrip "Timing" Belt drive. For example, *it is the only positive drive that never needs lubrication.*

THE LIST OF USES GROWS DAY BY DAY! Power production machinery in every field is made more efficient, volume of production increased, and maintenance costs lowered with this amazing belt. The list of OEM applications grows too numerous to mention. U.S. PowerGrip has streamlined hundreds of products...made them sell above competition. Some equipment would not be in existence at all, if it weren't for this great belt.

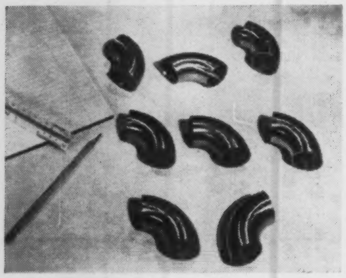
U. S. PowerGrip "Timing" Belt drives—from flea-power to 1000 h.p., and with ratios up to 12 to 1—are obtainable at any of the 28 "U. S." District Sales Offices, at selected "U. S." distributors, or by contacting us at Rockefeller Center, New York 20, New York. In Canada, Dominion Rubber Co., Ltd.

Send for free illustrated manual, complete with standard drive tables.

US RUBBER

Mechanical Goods Division

United States Rubber

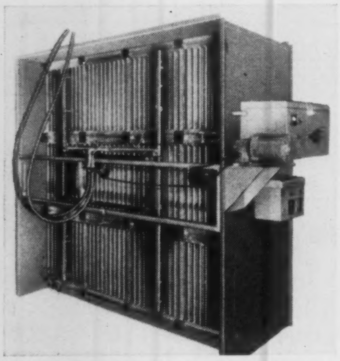


mal cross section, possess relatively good strength up to moderately high temperatures. Are said to have high degree of stability under radiation.

Solenoid Valve . . .

. . . with 5 ton nominal rating (fluorinated hydrocarbon refrigerant No. 12)—*Sporlan Valve Co., Dept. HPAC,* 7525 *Sussex Ave., St. Louis.*

"Type 20" has maximum opening pressure differential of 275 psi. Can be used with both refrigerants Nos. 12 and 22. With 5/16 in. orifice, 5/8 in. ODF (sweat) connections on inlet and outlet.



Electronic Air Cleaners . . .

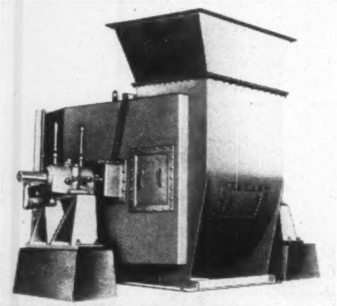
. . . for installation in forced air ventilating systems of commercial, industrial buildings—*Electro-Air Cleaner Co., Inc., Dept. HPAC,* 1285 *Reedsdale St., Pittsburgh* 33.

"Hi-C" units are said to have greater cleaning efficiency at higher velocities, take up less space. Ionizing-collecting cell has face velocities to 600 fpm, 40 percent savings in face area, maximum dirt loading capacity, says company. Available with horizontal or vertical air flow.

Stainless Steel Pumps . . .

. . . in two new series — *Bell & Gossett Co., Dept. HPAC,* 8200 *N. Austin Ave., Morton Grove, Ill.*

All wetted parts 316 stainless. Recommended by company for food products, most chemical process liquids. Capacities range to 200 gpm, heads to 120 ft. Cited features: quiet operation, easy servicing, wear resistant "Remite" mechanical shaft seal. "Series 1522" units are of compact, "Uni-built" design, while "Series 1512" models are of long coupled design.



Induced Draft Fan . . .

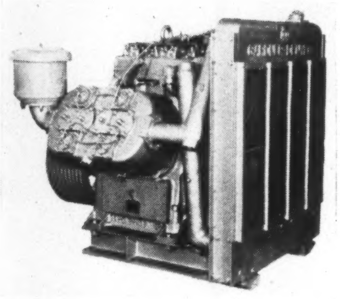
. . . with 36 aerodynamically curved blades whose design is said to provide low tip speed characteristic — *Clarage Fan Co., Dept. HPAC, Porter St., Kalamazoo* 16, *Mich.*

Because of design of fan wheel and housing, floor space and height requirements are minimized while high efficiency is maintained, says company. "DN Dynacurve" units built in standard tip speed designs to 14,000 cfm. Other cited features: very sturdy construction, wide performance range, broad static pressure volume.

Air Hammer . . .

. . . with compact size — *E. V. Nielsen, Inc., Dept. HPAC, Stamford, Conn.*

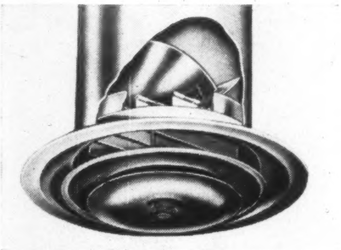
Is said to make one-hand operation comfortable while delivering sufficient power to close Pittsburgh lock seam on 16 gage cold rolled steel. Safety feature makes it impossible to operate tool unless bit is held firmly to work, says company. Operates at 30 to 100 lb air pressure.



Air Compressor . . .

. . . in new high capacity model — *Gardner-Denver Co., Dept. HPAC, Quincy, Ill.*

"Model WBN" designed to save floor space. 200 hp, two-stage unit occupies 34 sq ft. Needing no special base, all that is required to put unit into operation is to bolt it down, hook it to power source, says company. Available with tube type intercooler or with self contained radiator-intercooler.



Circular Air Diffusers . . .

. . . engineered to provide uniform, draftless, noiseless air distribution — *Air Devices, Inc., Dept. HPAC,* 185 *Madison Ave., New York* 16.

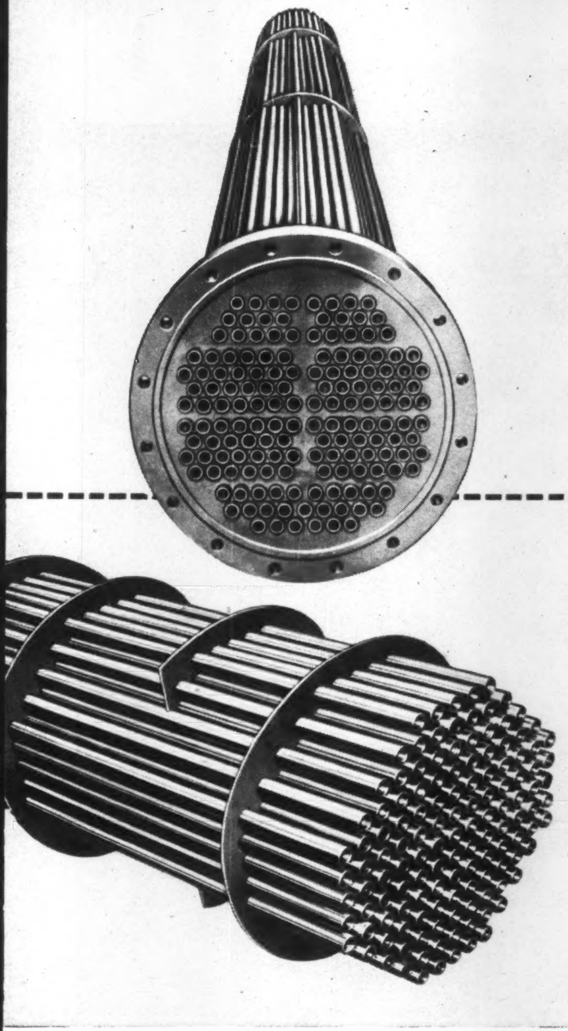
Rings of "CN" fabricated of spun aluminum, are firmly joined together to insure ruggedness, says company. Center core removable to facilitate mounting, access to volume damper with equalizing vanes. In range of sizes for cooling or heating applications.

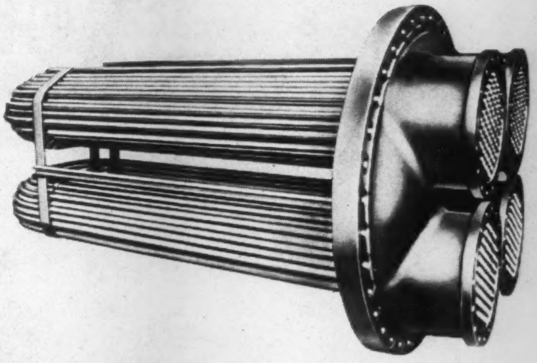
Torch Alloy . . .

. . . for joining poor fitting aluminum — *Eutectic Welding Alloys Corp., Dept. HPAC,* 40-40 172*nd St., Flushing* 58, *N. Y.*

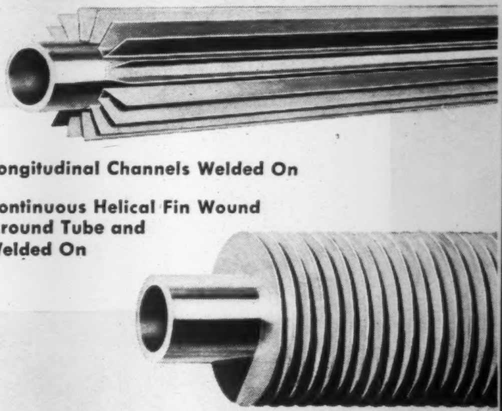
"EutecRod 999FC" is said to be unusual bead forming, thin flowing

(*Continued on page* 194)





TWO GOOD WAYS TO ADD ADDITIONAL HEAT TRANSFER SURFACE AREA TO B&W CARBON STEEL ERW TUBES



(A) Longitudinal Channels Welded On

(B) Continuous Helical Fin Wound Around Tube and Welded On

TUBING REQUIREMENTS FOR HEAT TRANSFER EQUIPMENT

The economy and usefulness of pressure tubing in heat exchanger and condenser applications depend on the tubing's heat transfer ability and the ease with which it can be bent, coiled, swaged, and rolled into tube sheets.

Because of its uniform wall thickness, the heat transfer ability of B&W Electric-Resistance-Welded Carbon Steel Tubing is the optimum for such a ferrous material. It is an economical material to use, not only because of its reasonable first cost, but also because of its low fabrication cost, since ease of bending, coiling, swaging, and rolling into tube sheets is provided through quality-controlled methods used in its manufacture.

B&W Electric-Resistance-Welded Carbon Steel Heat Exchanger and Condenser Tubing is widely used in the process industries, including petroleum refining and chemical processing, and in refrigeration and steam generating equipment. If carbon steel tubing can do the job required, you will find B&W ERW Tubing provides maximum, trouble-free service life. For additional information, call on Mr. Tubes, your nearby B&W Tube Representative — *or write for Bulletin 412.* The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

B&W TUBULAR PRODUCTS DIVISION

TA 6099 PG-2

Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy, and stainless steels

B.F.Goodrich

Cell-Tite® Tubing saves Sheraton a cool $9,517.26

Philadelphia's new Sheraton boasts 8,100 feet of B. F. Goodrich Cell-Tite Tubing on water lines of 1,000 room air conditioners, and for good reason!

Saves labor costs: "With Cell-Tite Tubing," says Mr. Earle Baltz, executive of Achenbach & Butler, Inc. insulation specialists, "we cut the time needed to put insulation on two lengths of pipe from a normal three hours to only 20 minutes. This individual saving of two hours and forty minutes became a saving of 2,666 man-hours on the whole job. Labor on this costs $3.57 per hour – multiplied by the total time, making a saving of $9,517.26!"

Why they selected Cell-Tite: "Cell-Tite effectively prevents condensation on pipes carrying cold water through warm areas, holds heat of hot water in pipes. The material suffers no effects from constant exposure to maximum heat rating . . . continually holds up under heats approaching its rated 220° resistance, has a K factor of 27 giving maximum insulation without undue thickness, is consistent and uniform in quality and assures even all-around insulation by being of 'closed-cell' construction."

Easy to install: "This tubing cuts labor costs by easy-threading on pipe, fits around bends, gives a much neater appearance. To strip the ends, we held the Cell-Tite Tubing back clear of the connection, held it in place with wire. After the connection was made, the wire was cut and the insulation moved over the exposed section. Even after being wired in a compressed position for two months, Cell-Tite showed no permanent set!"

Get free booklet: For complete information and free booklet on Cell-Tite Tubing, Strip and Cord, write B. F. Goodrich Sponge Products, a division of The B. F. Goodrich Company, 381 Derby Place, Shelton, Connecticut.

B.F.Goodrich

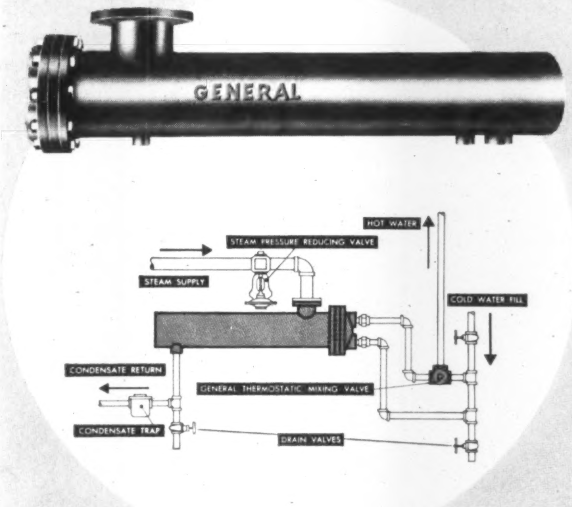
SPONGE PRODUCTS

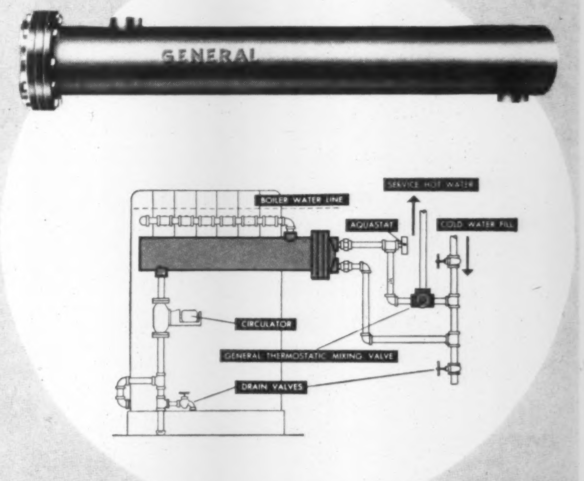
You Get These 3 Big Job-Advantages with GENERAL INSTANTANEOUS WATER HEATERS

1 A Compact, Efficient Service Hot Water System — at 1/3 the cost! With simple, compact GENERAL Instantaneous Water Heaters, you can now replace bulky, out-dated storage tank systems in commercial and industrial buildings, apartments, motels, institutions . . . give your customers a modern source for continuous hot water at a fraction of former cost! General Instantaneous Heating requires no space-consuming tank. Water is heated only as needed. Fuel consumption and heat waste are minimized. In both economy and efficiency, it gives you a real competitive advantage in today's big remodeling field!

2 Easy Installation Installation of General Instantaneous Heaters is also quick, easy — more profitable to you. Piping is short and simple. Capacities to 300 gpm. Largest of 20 heater sizes is less than 21″ by 84″. Heating unit is located directly at boiler for boiler water systems . . . or tapped in existing steam lines with live or exhaust steam as heat source.

3 Little Maintenance — No Costly Call-Backs On-the-job performance has shown that General Instantaneous Heaters outlast, by far, all other types of water heating systems. Rugged, engineered design meets precise job specifications. Less piping means less maintenance. Seamless copper tubing, and all-bronze head and tube plate assure clean, rust-free hot water . . . years of trouble-free operation.


GENERAL
HOT WATER
STEAM PRESSURE REDUCING VALVE
STEAM SUPPLY
COLD WATER FILL
CONDENSATE RETURN
GENERAL THERMOSTATIC MIXING VALVE
CONDENSATE TRAP
DRAIN VALVES


GENERAL
SERVICE HOT WATER
BOILER WATER LINE
AQUASTAT
COLD WATER FILL
CIRCULATOR
GENERAL THERMOSTATIC MIXING VALVE
DRAIN VALVES

REMODEL COMMERCIAL HOT WATER SYSTEMS:

STEAM With steam as heat source, General Instantaneous Heaters can be spotted anywhere near existing steam lines — on the floor, wall, overhead and out of the way.

BOILER WATER Simple installation with General Instantaneous Heater mounted at boiler. Saves fuel and heat . . . provides plenty of continuous, hot water, even when boiler is operated at 180° during summer months. Baffle-type construction provides extremely efficient heat transfer . . . high output from small unit.

MAIL COUPON TODAY!

GENERAL FITTINGS GF
COMPANY

Instantaneous Water Heaters,
Converters, Fuel Oil Heaters,
and Heating Specialties

GENERAL FITTINGS COMPANY
P. O. Box 151E, East Greenwich, R. I.

Gentlemen: Please send descriptive catalog for the complete line of GENERAL Instantaneous Water Heaters.

Name..

Company..

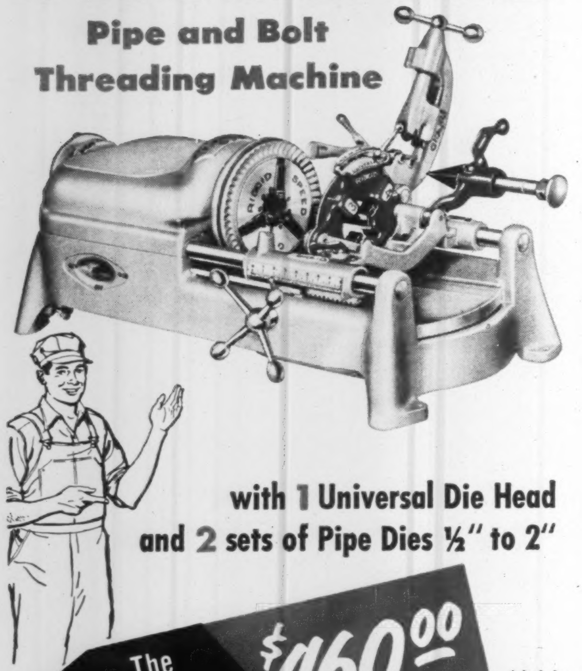
Address..

City.................................... **State**....................

New

535 RIDGID

Pipe and Bolt Threading Machine



with 1 Universal Die Head and 2 sets of Pipe Dies ½" to 2"

The Complete Package $460.00 (slightly higher in Canada)

Your best buy for fast easy pipe work . . . by power

Full range of pipe and bolt dies for universal head available

Complete machine, including Speed Chuck guaranteed to grip tight any pipe or conduit, forward, reverse . . . 1 universal quick-opening die head that adjusts to size right in machine, with 2 sets of dies, one for ½" and ¾", one for 1", 1¼", 1½", and 2". Roll type cut-off with self-centering full-floating cutter wheel . . . Five-Flute cone reamer, ⅛" to 2" . . . *Above 3 tools operate independently, swing up out of way when not in use, so pipe can be chucked from front* . . . Powerful 115/120 volt universal motor . . . All 500 and 500A die heads and accessories fit this 535 machine . . . See all the other RIDGID efficiency features of this remarkable 535 at your Supply House!

You can't afford to thread, cut and ream pipe by hand!

The Ridge Tool Company, Elyria, Ohio, U.S.A.

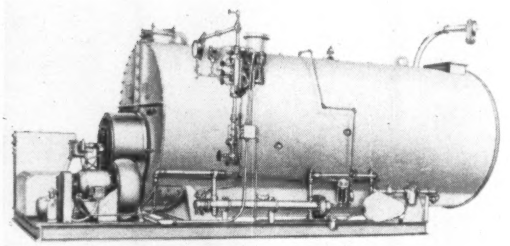
RIDGID

Work-Saver Pipe Tools

EQUIPMENT DEVELOPMENTS

Continued from page 190

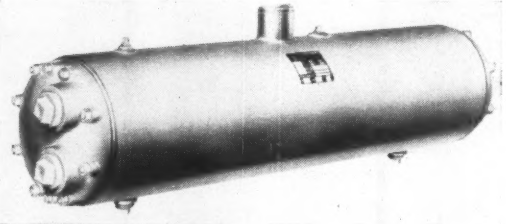
alloy. For applications where joint design is not critical. Cited advantages: good workability, lower bonding temperature, ability to run deposits in vertical-up and overhead positions.



Packaged Steam Generator . . .

. . . with three-pass design with gas vent in rear—*Erie City Iron Works, Dept. HPAC, Erie, Pa.*

"FT" combines oil, gas or combination burner with safety controls and instrumentation piped, wired, factory assembled. Is said to have 5 sq ft heating surface per developed horsepower. Is pressurized unit using forced draft to provide precise control of excess air, CO_2. In sizes 50 to 600 developed hp.



Straight Tube Stock Condenser . . .

. . . added to company's "Hydro-Flo" refrigeration equipment series—*Bell & Gossett Co., Dept. HPAC, 8200 N. Austin Ave., Morton Grove, Ill.*

"Model RCF" is said to offer features of more compactness, greater safety allowance. Minimum maintenance assured since designed fouling factor allows twice the fouling accepted in industry, says company. With removable heads, straight tubes for cleaning of water passages.

Polyethylene Plastic Pipe . . .

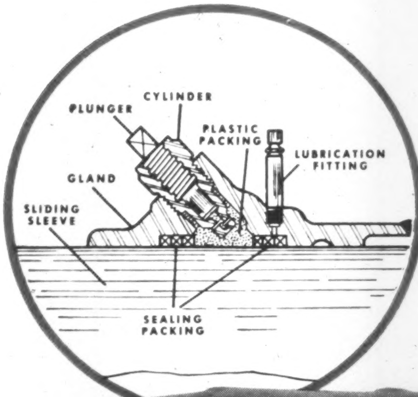
. . . in two types, in diameters ½ to 6 in.—*Evanite Plastic Co., Div. of Evans Pipe Co., Dept. HPAC, Uhrichsville, Ohio.*

One type for potable water and food products use; other type for water, waste, chemical service. Both in schedule 40 standard wall and 75 lb working pressure types. Smaller diameters available in 100 to 400 ft coils, large sizes in 24 ft straight sections.

new savings

for expansion joint users

Cross-section of Gun-Pakt feature. To add packing, just add a plug and turn the plunger.



The Yarway Type W Gun-Pakt Expansion Joint has an improved one-piece design of body and gland and improved method of packing that provide new maintenance economies and greater operating efficiency.

Bolted joint between body and gland is eliminated; the steel body includes gland and guide. Shorter face-to-face dimensions are possible. Improved angle of packing guns makes them more accessible and *permits injection of the special plastic packing directly into packing space.*

The famous Yarway *Gun-Pakt* feature permits *addition of packing under full steam pressure. No need for costly shutdowns to repack.*

Sizes 1½″ to 30″, pressures 150, 300, 400 psi. Single or double types, flanged or welding ends.

For full description, write for new Yarway Bulletin EJ-1916.

20″ Yarway Type W Gun-Pakt Joint with base, single type, welding ends, 8 guns.

YARNALL-WARING COMPANY
107 Mermaid Avenue
Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY GUN-PAKT

...a good way to specify expansion joints

for pumping domestic and industrial wastes . . .

This Shone ejector has been in operation for 68 trouble-free years—in the Auditorium Hotel (Roosevelt College), Chicago, Illinois.

YEOMANS pneumatic ejectors cut service costs because

THERE'S NOTHING TO WEAR OUT

- NO ROTATING PUMP PARTS
- NO AIRTIGHT FLOATS
- NO HIGH-SPEED SHAFTS OR BEARINGS

With Yeomans pneumatic ejectors, maintenance costs are **50% to 75%** lower than with the best centrifugal pumps. The secret? Simplicity of design. Yeomans pneumatic ejectors are built to give you decades of trouble-free service—in fact, they will outlast your system.

They're recommended for low gallonages. Even the smallest Yeomans ejector will pass solids up to the size of the inlet and discharge valves . . . minimum of four inches. No danger of clogging.

They're safer, and completely sanitary. Fully enclosed, hermetically sealed. Dangerous hydrogen sulphide gas is never released.

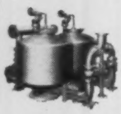
Yeomans manufactures both centrifugal pumps and pneumatic ejectors, but recommends the ejector where extreme dependability is required. Among the seven models and more than 100 sizes there is a pneumatic ejector that will exactly fill your needs.

Manufacturers of: pumps for drainage • sewage • condensation return • water supply and circulation • equipment for treatment of domestic and industrial wastes.

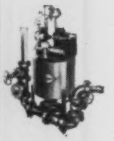
YEOMANS

YEOMANS, 2000-5 N. Ruby Street, Melrose Park, Illinois

Please send me literature on the pneumatic ejectors I have checked.



The Shone ☐



The Packex ☐

The Expelsor ☐

*name*____________________________

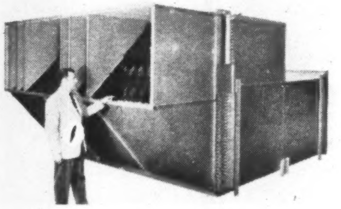
*company*__________________________

*street*____________________________

*city*______________ *zone*_____ *state*________

EQUIPMENT DEVELOPMENTS

Continued



Air Handling Unit . . .

. . . with 35,000 cfm capacity, 58 sq ft coil face area, cooling range to 100 tons — *Recold Corp., Dept. HPAC, 7250 E. Slauson Ave., Los Angeles 22.*

Designed for use in factories, large retail stores, multiple-story office buildings. "MZH-580" available in three styles: vertical draw-through, horizontal draw-through, blow-through with individual zones.

Viscometer . . .

. . . designed for high accuracy in 77 to 210 F temperature range—*American Instrument Co., Dept. HPAC, 8030 Georgia Ave., Silver Spring, Md.*

"Aminco-Saybolt" engineered to evaluate viscosity of any petroleum product. Unit holds two standard saybolt tubes. Tubes are lowered in temperature controlled oil bath. Bath liquid heated by three electric heating elements. Three sizes of orifices —universal, furol or asphalt—employed in tubes, and are interchangeable without emptying bath. Viscosity determined by measuring elapsed time for given volume of test material to drip through an orifice of given diameter at specific temperatures.

Electrode . . .

. . . formulated for fabrication of chrome-moly steel, other high tensile alloy steels—*Eutectic Welding Alloys Corp., Dept. HPAC, 40-40 172nd St., Flushing N.Y.*

"71 AC-DC" features ease of application regardless of current or position, says company. Designed mainly for low alloyed steels. In 3/32, 1/8, 5/32 in. sizes.

NEW 24-PAGE

Steam Coil Bulletin

Marlo
STEAM COILS
BULLETIN 10
Pages 1-24
JANUARY 1957
CONTENTS
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MARLO COIL CO
File No 30-F-5

INCLUDES:

- Capacity Data and Ratings
- Coil Selection Method
- Dimensional Data

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Quality Air Conditioning and Heat Transfer Equipment since 1925

MARLO COIL COMPANY
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Please send a copy of your new Steam Coil Bulletin to

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adds up to
New York's
most exciting
new building

Tishman Realty & Construction Co., Inc. — Owners & Builders. Carson & Lundin — Architects. Victor Mayper & Associates — Engineers.

featuring complete—quiet Air Conditioning thanks to

Quiet Duct

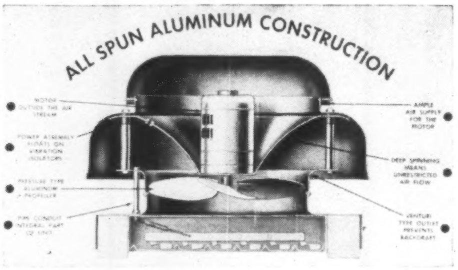
IAC
Your Standard of Silence

Latest addition to the New York Skyline, 666 Fifth Avenue silenced its air-conditioning and ventilating system *in the design stage* with rated IAC Quiet-DUCTS! Pre-fabricated in as many as 148 sizes, these economical Quiet-DUCT units, measuring in length from 2 to 10 feet, provide as much noise control as a conventional lined duct measuring from 30 to 100 feet long!

COMPLETE DATA AVAILABLE

Write today for a complete set of data sheets and catalog describing prefabricated "Quiet-DUCT" units.

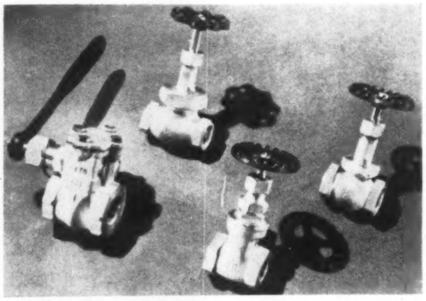
INDUSTRIAL ACOUSTICS COMPANY, INC.
Specialists in Noise & Pulsation Control
341 Jackson Avenue, New York 54, N.Y. CYpress 2-0180


ALL SPUN ALUMINUM CONSTRUCTION
MOTOR OUTSIDE THE AIR STREAM
POWER ASSEMBLY FLOATS ON VIBRATION ISOLATORS
PRESSURE TYPE ALUMINUM PROPELLER
PIPE CONDUIT INTEGRAL PART OF UNIT
AMPLE AIR SUPPLY FOR THE MOTOR
DEEP SPINNING MEANS UNRESTRICTED AIR FLOW
VENTURI TYPE OUTLET PREVENTS BACKDRAFT

Roof Ventilator . . .

. . . with aluminum propeller, spun aluminum construction of all parts except motor—*Loren Cook Co., Dept. HPAC, 227 Depot St., Berea, Ohio.*

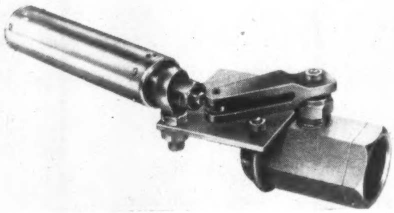
"FD" is direct drive ventilator with pressure type propeller. Available in four sizes 680 to 4040 cfm. Two-speed and explosionproof designs available. Power assembly rests on rubber vibration isolators.



Bronze Heavy Duty Valves . . .

. . . for commercial, industrial applications.—*Hammond Brass Works, Dept. HPAC, 1844 Summer Blvd., Hammond, Ind.*

Line includes gate valves to 200 lb working steam pressure, globe valves to 300 lb working steam pressure, swing checks to 150 lb working steam pressure. Shown are (left to right): quick opening gate valve with cam operated solid wedge disc, composition disc globe with union bonnet and slip-on type disc holder, NRS gate valve with solid wedge disc, brass disc regrinding globe with union bonnet.

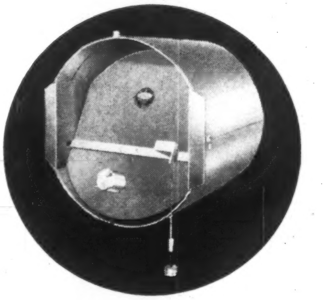


Air, Hydraulic Operators . . .

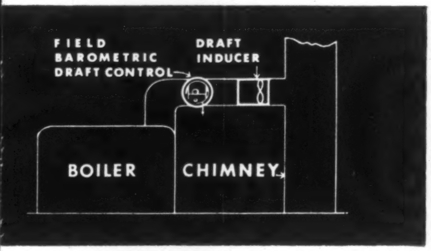
. . . added to company's line of "Double Seal" ball valves (1/4 to 4 in.) designed for two-way pneumatic

FIELD BAROMETRIC DRAFT CONTROLS

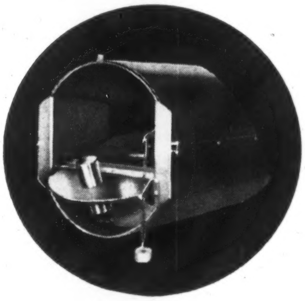
increase the efficiency of induced-draft installations



FIELD TYPE "M" Barometric Draft Control for coal or oil, sizes up to 32".



Field Barometric Draft Control installed in connection with a draft inducer prevents fuel waste caused by wide variations in draft.



FIELD TYPE "MG" Barometric Draft Control for gas or oil-gas, sizes up to 32".

When a draft inducer is used, to assist a faulty chimney, or to permit modern, low-stack construction, a Field Barometric Draft Control should also be installed. In such an installation, the inducer can be set to meet maximum, "high-fire" draft needs without risk of excessive draft. Whenever the draft requirement is less than the draft inducer setting, the Field Control automatically reduces the draft. Here is why the Field Draft Control can make an important contribution to efficiency at all firing rates:

1 - During "off-fire" periods, even the *natural* draft present may be excessive. Field reduces the draft, prevents rapid cooling of the boiler.

2 - During "low-fire" periods, the artificially induced draft may be greater than needed to vent a relatively small volume of gases. Field regulation prevents the loss of high temperature gases.

3 - During "high-fire" periods the Field Control compensates for continuously variable factors affecting draft. For example:

Changes in line voltage, affecting blower speed, change the volume of gases handled and thereby affect the draft.

Changes in resistance caused by the accumulation of fly ash or soot in boiler and breeching cause changes in the draft needed.

Changes in wind and outside temperature, affecting natural draft, cause variations in the artificial draft needed.

Where a number of boilers are discharging into a common stack, the need for draft will vary as firing rates vary. Draft required with all boilers on "high-fire" may be excessive when one or more boilers cut out.

A Field Barometric Draft Control, sensitive to the slightest change in pressure, corrects for any variation, holding draft to the required setting. Write us for technical data. Field Draft Controls are available in sizes up to 32 inches for oil, gas, coal and oil-gas installations.

field

FIELD CONTROL DIVISION
of H. D. Conkey & Company, Mendota, Illinois

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DETROIT CONTROLS

the names are good

Reputation is a matter of record. And the record of D. T. Williams for dependability and performance has been firmly established over the years.

Now, as a part of Detroit Controls, the high quality is being maintained, so that you may continue to place your confidence in this product, assured of ready supply and good service.

because the products are right

No. 856 "Vulcodisc" Lift Check Valve

Vulcanized asbestos disc. For 200 lbs. working steam pressure at 500° F. or 400 lbs. working non-shock gas and liquid pressure at 150° F. Installed in horizontal position. Screw cap and screw ends.

No. 1086 Swing Check Valve

Vulcanized asbestos disc. For 200 lbs. working steam pressure at 500° F. or 400 lbs. working non-shock gas and liquid pressure at 150° F. Installed in horizontal or vertical position. Screw cap and screw ends.

No. 912 "Vulcodisc" Globe Valve

May be used for steam or hot water with pressures to 200 lbs., temperatures to 500° F.; or water, gas and air to 400 lbs. at 150° F.; for oil to 200 lbs. pressure at 250° F.

No. 833 Horizontal Check Valve

Renewable composition, air disc, integral seat, screw ends, spring loaded disc. 300 lbs. working non-shock gas and liquid pressure at 150° F.

These valves meet all government, marine and industrial specifications.

Quality Protects Your Investment--
American-Standard Quality Is Available At No Extra Cost.

Bridgeport 1
Connecticut

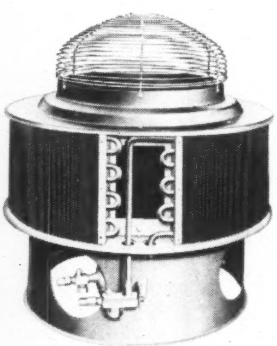
DETROIT CONTROLS
Division of American-Standard

EQUIPMENT DEVELOPMENTS

Continued

or hydraulic remote and sequence operation—*Jamesbury Corp., Dept. HPAC, 45 New St., Worcester, Mass.*

Remote operator comes as pretested assembly with ball valve, says company. Pilot valve also available as part of complete unit. Cited advantage of operators is that they permit manual operation of valves in case of power failure. For use with standard stainless steel, bronze, carbon steel, aluminum or polyvinyl chloride ball valves from high vacuum to pressures to 2000 psi.



Air Cooled Condensers . . .

. . . with circular coil design—*Trane Co., Dept. HPAC, La Crosse, Wis.*

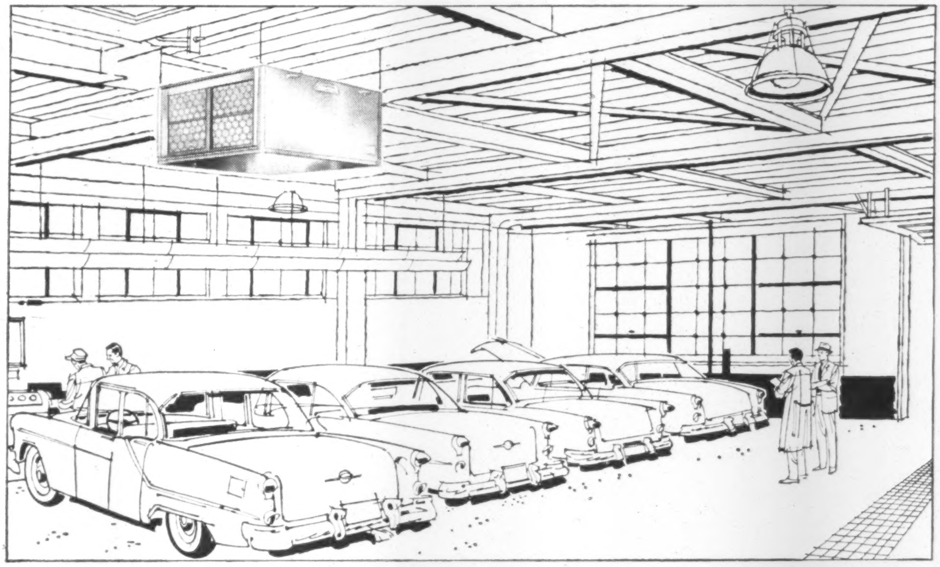
Using no water or sprays, units require only outdoor air induced through circular coil for condensing purposes, says company. For installation outdoors for remote connection to air conditioning unit inside. In three sizes, are used singly with 3, 5, 7½ hp packaged conditioners. Used in multiple combinations with larger equipment. Cited feature is very efficient heat transfer performance.

Dehumidifier . . .

. . . for low humidity storage, processing applications—*Dryomatic Corp., Dept. HPAC, 806 N. Fairfax St., Alexandria, Va.*

"Model 105" is automatically regulated dual-tower unit which uses silica gel as drying medium. Designed primarily as space dryer to maintain humidities down to 10 per-

New Mueller Climatrol 917 functions as both remote heating and cooling unit



Outstanding for stores, garages, restaurants, theaters, plant areas

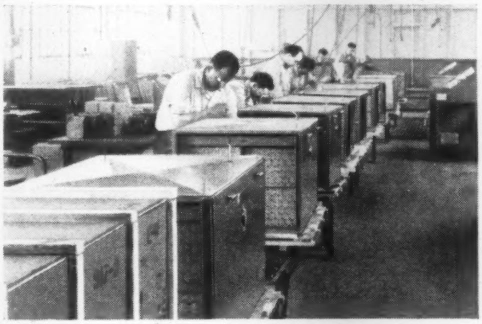
Top air circulation capacity, large-area built-in filter—and priced right! It's Mueller Climatrol's new 917 — in a class by itself for suspended installations. Designed for operation with remote air- or water-cooled condensing units, its big centrifugal blower distributes air effectively over large areas.

This unit can also be adapted to a year-round forced air system by adding an optional steam, hot water or electric heating coil . . . or will serve as a unit air conditioner with addition of an optional return air grille and discharge plenum. Choose from nominal 24, 36, 60 and 90-thousand Btu output cooling sizes.

New dealer "Signarama" scores immediate hit

Mueller
Climatrol
HEATING
COOLING
KONICKI
HEATING &
AIR CONDITIONING

And no wonder! With a fascinating flasher sequence that identifies the dealer in big letters, this spectacular outdoor display attracts attention from blocks away. Yet it's only about one-third the cost of a neon sign.



Mueller cooling production expanded to satisfy demand

To advance in step with today's trends in the heating-cooling industry, Mueller Climatrol recently increased cooling unit assembly capacity by 50%. The above is only one of three extensive production lines coordinated in one area to provide the flexibility demanded by Mueller Climatrol's growing volume and variety of air conditioning units. And with it comes even better quality control, even greater assurance of on-time deliveries for Mueller dealers.

Mueller Climatrol®

2023 W. Oklahoma Ave., Milwaukee 15, Wisconsin

MUELLER CLIMATROL PLANNING AIDS . . .
. . . CLIMATE CONTROL FOR HEALTHFUL LIVING

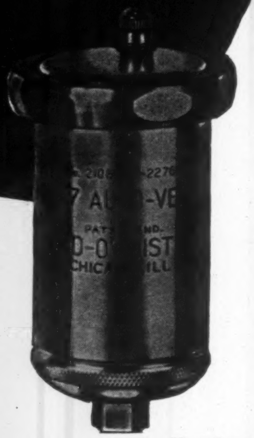
AIR IS THE VILLAIN!

in hot water heating or chilled water cooling systems

MAID-O'-MIST

Automatic AUTO-VENTS

CONTINUOUS VENTING ACTION
ENDS CIRCULATION WORRIES!



Float Type

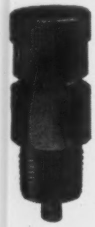
No. 7 AUTO-VENT

No wonder Number 7 is a big favorite with both heating and air-conditioning experts! Fully automatic, this brass vent has a self-closing, float-operated valve — all mounted on a removable bonnet for quick servicing. Small (4⅜" x 2¼" with ⅛" I.P. female connection) it does a big job of eliminating air. For pressure up to 75 lbs.

Float Type

No. 67 AUTO-VENT

Is the space limited? Then No. 67 is your Auto-Vent! Its overall size is only 3 3/16" x 1½" with ⅛" I.P. male connection. Takes 30 lb. pressure.



No. 72 AUTO-VENT

A fast-venting valve of the expansion type for convectors, baseboard and free-standing radiation. For vertical or horizontal mounting. Size 1¼" x ½" with ⅛" I.P. male connection. Disc dries quickly because of immediate drainage.

Float Type

No. 27 AUTO-VENT

Smaller sized (3" x 2½") for horizontal mounting with ⅛" I.P. female side connection. Use on convectors, radiant coils, etc. Takes up to 50 lb. pressure.

Float Type

No. 37 AUTO-VENT

Similar to No. 27, but designed for horizontal mounting with ⅛" I.P. vertical male bottom connection. Size 3" x 2½". 50 lb. pressure.

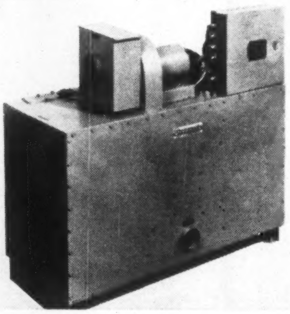
Get full information from your jobber or write for catalogue, today!

MAID-O'-MIST Inc.

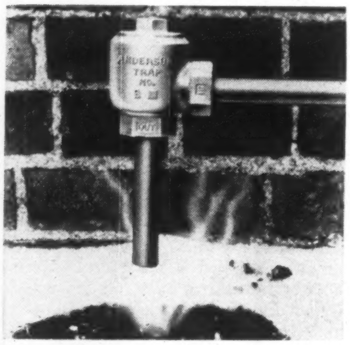
MAID-O'-MIST, Inc.
3217 NORTH PULASKI ROAD · CHICAGO 41, ILL.

EQUIPMENT DEVELOPMENTS

Continued



cent in areas to 35,000 cu ft over wide temperature range. Will also provide low dew point air for processing applications and can be used alone or in combination with cooling equipment in comfort conditioning systems, says company.



Thermostatic Traps . . .

. . .designed to meet weather conditions in outdoor steam processing—*V. D. Anderson Co., Div. of International Basic Economy Corp., Dept. HPAC, 1935 W. 96th St., Cleveland.*

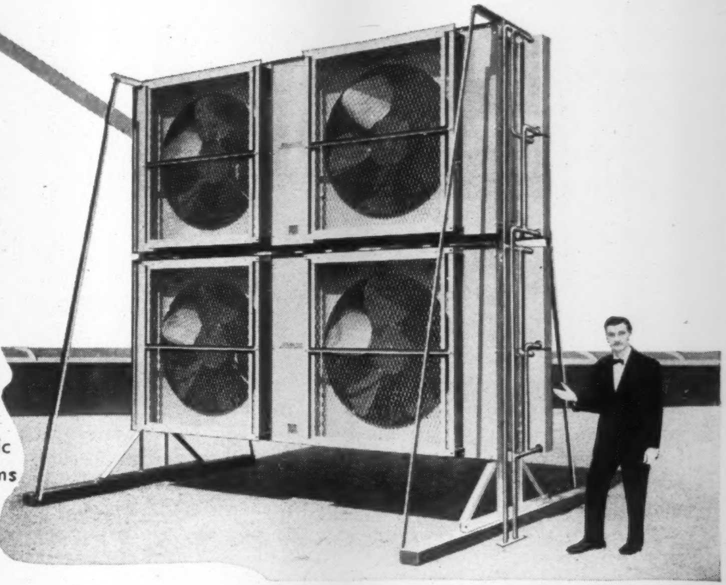
"Quick-Flex," said to be freezeproof, recommended by manufacturer for tracer lines, meter boxes, other applications in chemical, refinery, solvent and other continuous processes. With downward flow of steam and condensate which permits automatic draining at all times, says company. For capacities to 31,000 lb per hr of condensate. Pipe sizes range ½ to 1½ in.

Motors . . .

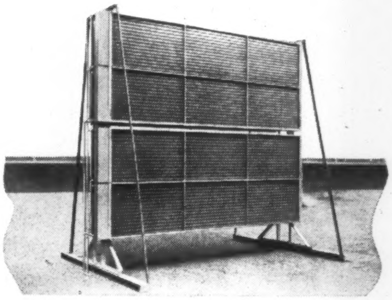
. . .in new NEMA frame sizes 182 to 254U—*Wagner Electric Corp., Dept. HPAC, 6400 Plymouth Ave., St. Louis 14.*

KRAMER UNICON

GETS BIGGER and BIGGER



There is only one answer to large capacity condenser problems — the KRAMER UNICON. Every day more engineers plan larger tonnage installations — 50, 100 and even — 800 tons. And every day UNICONS are shipped to all parts of the world for giant-sized installations. No other air-cooled condenser can match the long, successful record of UNICON, backed by thousands of applications since 1937 — in the widest range of tonnages and climatic conditions. Your condensing problems can be best answered by use of the best — the KRAMER UNICON.

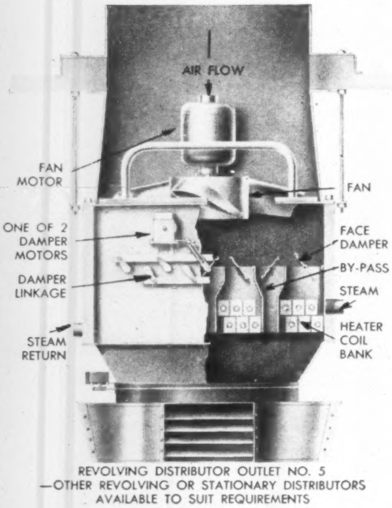


Space-saver UNICON, *as illustrated,* serves a 60-Ton air conditioning system, yet takes but 70 sq. ft. of roof space.

UNICON is a remote-type air-cooled condenser that requires no water. KRAMER UNICON can be used with any size compressor, REGARDLESS of horsepower. Any size refrigeration or air conditioning system can be air-cooled with UNICON, REGARDLESS of tonnage. UNICON requires less horsepower, less piping, is easier to install and costs less. KRAMER UNICON performs best — even in semi-tropical climates.

WRITE FOR BULLETIN U-210D

KRAMER TRENTON CO. • Trenton 5, N.J.



REVOLVING DISTRIBUTOR OUTLET NO. 5
—OTHER REVOLVING OR STATIONARY DISTRIBUTORS AVAILABLE TO SUIT REQUIREMENTS

MAKE-UP AIR... or
COMFORT VENTILATION

Wing FAS Heaters deliver fresh air at room temperature... with no danger of freezing

Manufacturing processes frequently create heat, fumes, vapors, dust, etc., which must be removed at the source by fans or exhaust systems, and must be replaced, both to permit the exhaust systems to function efficiently, and for the comfort of the workers. For when a building is "starved for air", cold air will rush in through cracks and crevices, trying to eliminate the partial vacuum, and consequently causing much discomfort.

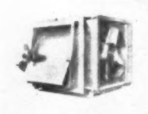
Wing FAS Heaters are designed to deliver to the building an amount of air equal to that which is exhausted, and at just the right temperature. The coils of these heaters cannot freeze, for steam is at full pressure at all times. Temperature is controlled by dampers on heating coils and by-pass passages.

Send for bulletin. Use the coupon.

L. J. Wing Mfg. Co.
140 **Vreeland Mills Rd., Linden, N. J.**
Factories: Linden, N.J. and Montreal, Canada
In Europe: WANSON, Haren-Nord, Brussels, Belgium

· Wing ·
(FRESH AIR SUPPLY)
FAS HEATERS

WING REVOLVING HEATERS


WING DRAFT INDUCERS

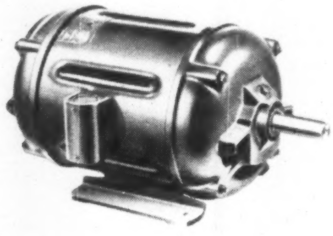
WING FANS

WING TURBINES

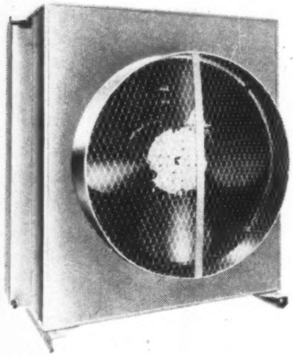
L. J. Wing Mfg. Co., HP-8
140 Vreeland Mills Rd. Linden, N.J.
Please send copy of Fresh Air Supply Bulletin FAS-1.
Name..........
Firm..........
Address..........
City.......... Zone...... State..........

EQUIPMENT DEVELOPMENTS

Continued



Repulsion-start induction single phase units in integral four-pole ratings 1 to 5 hp. Motors, in new frames, are now interchangeable with capacitor-start and small polyphase motors of same ratings, says company. Recommended by manufacturer for applications with heavy starting duty requirements.



Air Cooled Condensers . . .

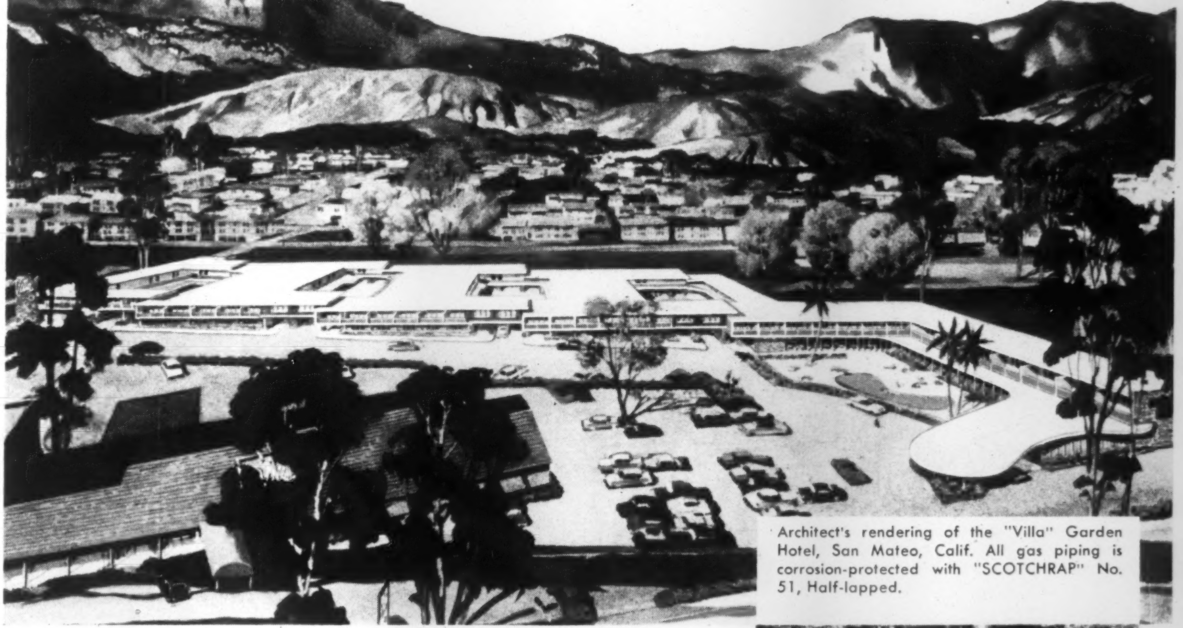
. . . in new belt driven fan models — *Larkin Coils, Inc., Dept. HPAC, 519 Memorial Dr., S. E., Atlanta 1.*

Belt driven "BFC" units available in 5, 8, 10, 15, 20 ton capacities; are said to operate at very low noise levels. Direct drive "FC" models built in 2, 3, 5, 8, 10 ton capacities; are designed to require minimum maintenance. Both series of "Zephyrcons" engineered for parallel use to provide adequate capacity for any air conditioning, refrigeration system, says company.

Air Filters . . .

. . . with cleanable, metal screen media—*Farr Co., Dept. HPAC, P.O. Box 45187 Airport Station, Los Angeles 45.*

"F/S" units are permanent type,



Architect's rendering of the "Villa" Garden Hotel, San Mateo, Calif. All gas piping is corrosion-protected with "SCOTCHRAP" No. 51, Half-lapped.

Modern as they come... with SCOTCHRAP protection!

REG. U.S. PAT. OFF. BRAND

The "Villa" Garden Hotel, San Mateo, Calif., is the ultimate in this new type of hostelry. Everything about it is the best and most up-to-date obtainable. This includes the things guests never see . . . like the underground gas piping that is protected from corrosion by a continuous application of "SCOTCHRAP." "SCOTCHRAP" is tough, conformable polyvinyl chloride plastic, with pressure-sensitive adhesive in roll form. Application is quick, easy, clean—no heat, no fumes, no mess. This modern covering resists acids, alkalies, electrolytic corrosion. Available in standard widths and thicknesses.

40-foot lengths of 3½ and 4-in. pipe were shop-wrapped with "SCOTCHRAP". For special bends, cuts, and welds, "SCOTCHRAP" was removed from section, then re-wrapped by hand.

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SCOTCHRAP

BRAND

PIPE INSULATION

...by the makers of "SCOTCH" Brand No. 33 Electrical Tape

The terms "SCOTCHRAP" and "SCOTCH" are registered trademarks of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N. Y. In Canada: P. O. Box 757, London, Ontario.

Joints, tees, and fixtures were quickly, smoothly, and tightly wrapped for continuous protection with "SCOTCHRAP." **For further information, write 3M Co., St. Paul 6, Minn., Dept. PD-87.**

The heart of the matter

IS IN THE COVERING

Available in standard pipe sizes and fittings in three thicknesses; Light, (Ice Water to 30° F.) Medium, (Brine and Ammonia to 0° F.) Heavy, (Heavy Brine—25° F. and lower.)

UNITED CORK PIPE COVERING

THE IDEAL COLD LINE INSULATOR

Improper pipe insulation can mean an excessive loss in refrigeration efficiency and dollars to the cold storage operator. It is important to get the right pipe covering insulation that will have all these advantages:

Extremely low "K" factor
Retains over 80% of cold loss on piping
Easy and economical to install
Long trouble-free life
Fire retardant—Vermin resistant
No capillarity

LARGER STOCKS—FASTER DELIVERY—PERSONAL SERVICE

United Pipe Coverings are available from stock for prompt delivery—to fulfill your immediate installation requirements. Mail the coupon below for additional information or the United distributor nearest you.

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Manufacturers of cork insulation for almost a half century

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Engineering offices, or approved distributors, in key cities—coast to coast.

EQUIPMENT DEVELOPMENTS

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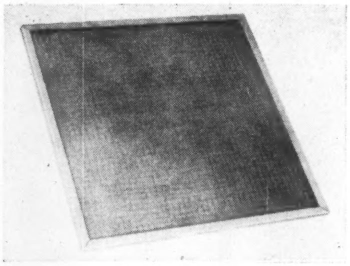
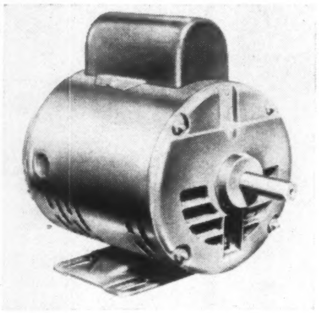


impingement filters designed to deliver 350 to 520 fpm. Are said to be especially effective in areas of high lint concentration. Filter mesh, consisting of flat and corrugated rows of wire screen mesh, will not gap or separate, says company. In standard sizes for use in ordinary filter banks.



FHp Motors . . .

. . . in new line of rerated units — *Motor Div., Robbins & Myers, Inc., Dept. HPAC, Springfield, Ohio.*

"Model R" motors, in NEMA frames 56 and 48, available in 1/8 to 1 hp ratings in polyphase, capacitor single phase, permanent split capacitor, (in smaller ranges) split capacitor types. Designed to be smaller, lighter in weight.

Power Drive Threader . . .

. . . designed to thread all sizes 1 to 2 in. with one set of dies—*Beaver Pipe Tools, Inc., Dept. HPAC, Warren, Ohio.*

Being same width as standard length thread, dies give "perfect" taper for entire length of thread, says company. "No. 78" threader is said to give faster operation with more

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CONDUCTIVITY
APPEARANCE
WORKABILITY
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answer them all with

HUSSEY

COPPER & BRASS

Yes, all of these physical properties and all of these production characteristics are yours when you specify genuine Hussey Copper. Some of them are natural to copper but Hussey's controlled quality manufacturing methods assure them *all* in Hussey Copper. Make your specification HUSSEY COPPER.

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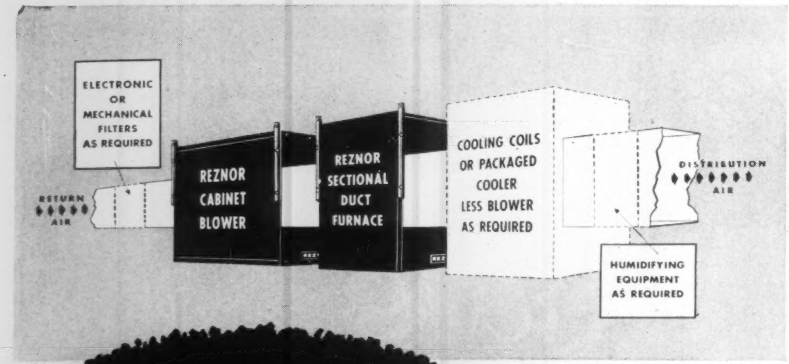
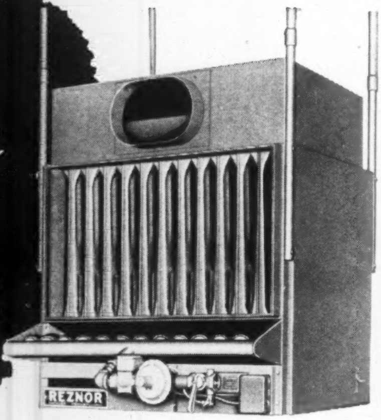

ELECTRONIC OR MECHANICAL FILTERS AS REQUIRED
RETURN AIR
REZNOR CABINET BLOWER
REZNOR SECTIONAL DUCT FURNACE
COOLING COILS OR PACKAGED COOLER LESS BLOWER AS REQUIRED
DISTRIBUTION AIR
HUMIDIFYING EQUIPMENT AS REQUIRED

How to Match a Heating System to Exact Job Requirements



Reznor sectional duct furnaces free the designer from the limitations imposed by packaged heating equipment . . . equipment which can't be *exactly right* for any one job because it has to be *good enough* for so many different jobs.

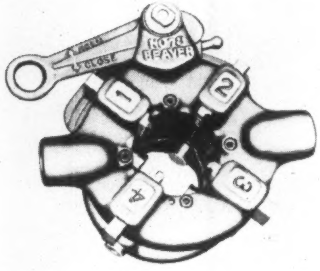
A heating or heating-cooling system designed around a Reznor duct furnace can be matched to exact job requirements. Each duct furnace is a compact, highly efficient heat exchanger with a full set of operating controls. All other components,—for air moving, cooling, cleaning and moisture control—are separately specified and installer-supplied. Only those components which are necessary on the particular job need be included, with each individually selected to fit that one job.

Sectional assembly (a completely new concept in duct heating equipment) completely eliminates the installation problems which formerly prevented the use of large capacity custom-engineered duct heating systems. With the Reznor Series DS sectional duct furnace, systems with capacities in excess of 2,000,000 Btu can be assembled on the job from sections weighing no more than 315 pounds. Each of four basic sections—150, 200, 250, and 300 thousand Btu—is complete with controls and is provided with its own built-in draft diverter, flue connections and mounting pipes.

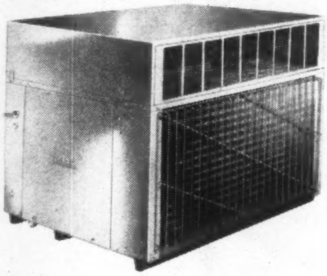
If you aren't taking advantage of the design flexibility of Reznor sectional duct furnaces, you're missing a good bet on many of your commercial, industrial and institutional jobs. Don't delay getting all the details on this versatile line of heaters. Give your nearby Reznor distributor a call—today.

REZNOR
WORLD'S LARGEST-SELLING DIRECT-FIRED
UNIT HEATERS
Reznor Manufacturing Co.,
51 Union St., Mercer, Pa.

for complete details,
wherever you are . . .
Look for Reznor under "Heaters-Unit" in the Yellow Pages



threads in less time. When thread is cut, dies are thrown open and tool is ready to use again without resetting.



Air Cooled Condenser . . .

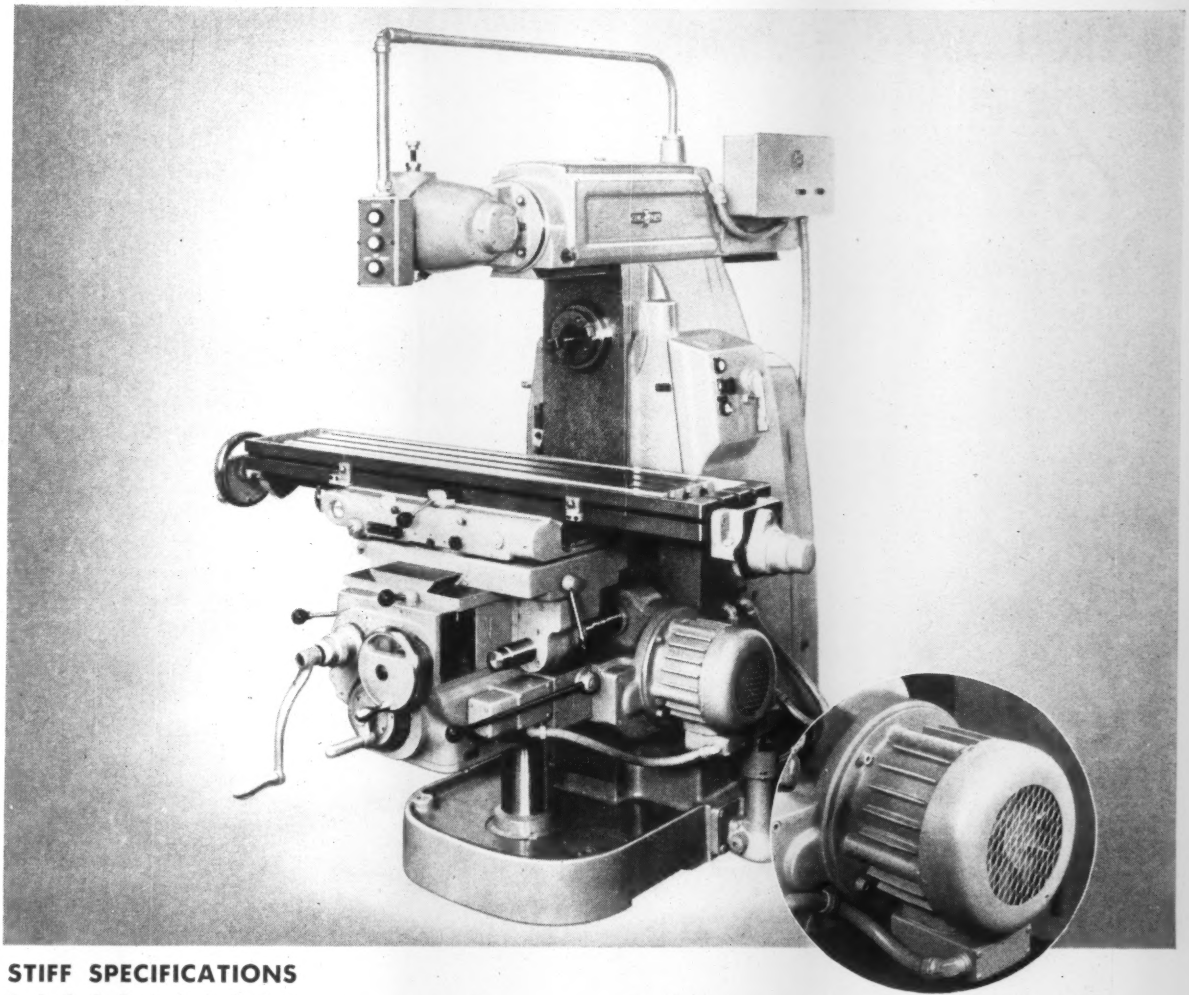
. . . for jobs requiring 4 tons cooling —*Lennox Industries, Inc., Dept. HPAC, Marshalltown, Iowa.*

"HSA3-400" remote type unit has special compressor, says company. Cited feature of "high side" unit is quiet, unique air handling arrangement. When special discharge hood is added, condenser air is discharge on same side of unit as air intake. Discharged air deflected upward so as not to recirculate through condenser coil. Feature is said to permit flexibility of installation.

Flux . . .

. . . designed to make possible new process in development of faster, more efficient bare "rod" braze welding — *Eutectic Welding Alloys Corp., Dept. HPAC,* 40-40 172*nd St., Flushing* 58, *N. Y.*

Formulated for cast iron, steel, brass, bronze. "Atmos No. 1" packaged in polyethylene squeeze bottle. Method of application is said to save time, reduce waste.



STIFF SPECIFICATIONS

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Yet a DIEHL motor met all requirements

The requirements of one of the largest milling machine manufacturers called for a close-coupled, special duty motor to raise and lower the knee and develop sufficient torque for heavy table loads in rapid traverse without stalling. Cool operation was imperative to avoid distortion of the machine table due to heat transfer. The motor was to be mounted directly on the gear case, therefore complete protection against oil leakage into the motor was essential. Motor size, compactness and appearance were important factors. DIEHL developed the special totally enclosed motor illustrated, which met all desired requirements. Cool operation was assured by the fan-cooled design of the motor, effectively preventing heat transfer. The flat-type construction saved considerable space and overhang, conforming well with machine contours. Positive and dependable machine operation was the end result.

This is another example of DIEHL accomplishment based on almost three-quarters of a century of experience in the design and manufacture of motors for industry. Utilize this experience in the solution of your motor problems. We'll work closely with you to provide the right motor — at the right time — at the right price.

Diehl

DIEHL MANUFACTURING COMPANY
Electrical Division of
THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

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belted and direct-driven

Aerovent

type LS

4-blade

industrial fans

Designed for high-volume air movement against resistances ¾" S.P. Featuring new, wider 4-blade "Macheta" Airfoil propellers, "LS" fans are available in ring, duct or square panel types. Standard construction features mean lower initial costs, with more efficient operation. Aerovent "LS" fans are the practical solution to all standard air-moving problems. Special motors, propellers, coatings available for corrosive conditions.

"ls" ring type fans

Available in belted or direct-driven, with ring accurately drilled to facilitate installation. 12" to 48". Capacities to 32,000 CFM.

"ls" square panel fans

Easily mounted in any position with 4 bolts. For air supply or exhaust. Heavy welded-steel construction. High-volume air movement. Sizes 24" to 48".

"ls" duct fans

Designed for use in all standard duct systems. More efficient performance at lower speeds, against static pressures to ¾" S. P. Sizes 24" to 48".

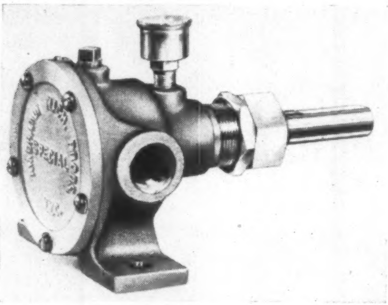
Write for Bulletin 730-A (Belt-Driven) or 775 (Direct-Driven)

Rated in accordance with Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Certified Ratings

Aerovent FAN CO. INC.

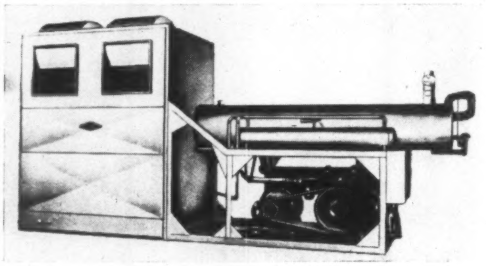
Ash and Branch Sts. Piqua, Ohio



Neoprene Impeller Pump . . .

. . . designed to operate in either direction at low or high speed with motor as small as 1/3 hp, single-phase —*American Machine Products, Inc., Dept. HPAC, 172 Centre St., New York* 13.

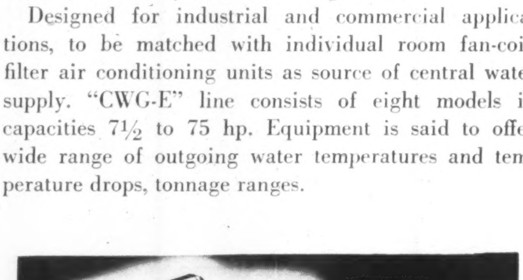
"K½ Special" is self priming and operates quietly, effectively, says company. Made of naval bronze with stainless steel shaft, is said to handle all liquids that do not affect bronze or neoprene, at 7½ gpm, 10 psi at 1750 rpm.



Packaged Water Chillers . . .

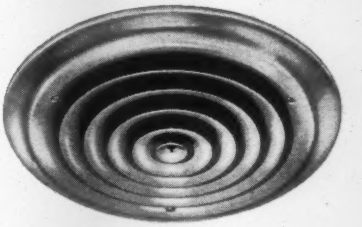
. . . with built-in evaporative condensers—*Drayer-Hanson, Div. of National-U.S. Radiator Corp., Dept. HPAC*, 3301 *Medford St., Los Angeles* 63.

Designed for industrial and commercial applications, to be matched with individual room fan-coil-filter air conditioning units as source of central water supply. "CWG-E" line consists of eight models in capacities 7½ to 75 hp. Equipment is said to offer wide range of outgoing water temperatures and temperature drops, tonnage ranges.

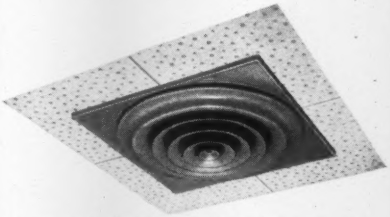


Portable Power Drive . . .

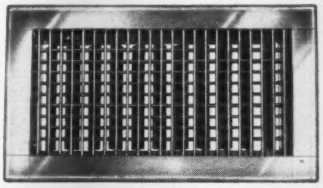
. . . with new polished aluminum housing—*Toledo*



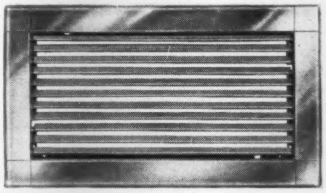
H&C NO. 16 DIFFUSAIRE® . . .



WITH H&C NO. 18 ADAPTER SQUARE



H&C NO. 92 VHV TRIPL-AIRE® MULTI-DEFLECTION REGISTER. Vertical face bars, horizontal secondary bars, vertical louvers.



NO. 94A FIXT-AIRE® GRILLE. Horizontal face bars set at 22° angle to conceal duct.

for IDEAL AIR DISTRIBUTION IN ALL COMMERCIAL AIR CONDITIONING INSTALLATIONS

The H&C No. 16 (step-down type) Ceiling Diffusaire, and its companion piece No. 15 (flush type) Diffusaire give you full 360°, draftless air distribution, particularly important in cooling. And with the H&C ADAPTER SQUARE, which harmonizes perfectly with acoustical tile ceilings, you have the "Round and Square" diffuser problem completely licked. There's no necessity of stocking more than one type diffuser. A butterfly damper with screwdriver adjustability from below is available with these diffusers.

For all other installations H&C TRIPL-AIRE and FIXT-AIRE Registers and Grilles provide every desirable factor entering into the achievement of perfect air conditioning: There are 10 types, 26 standard sizes of single and multi-deflection Grilles and Registers . . . providing 260 possible horizontal and vertical deflection combinations . . . plus a wide range of intermediate sizes. Consequently, there's never a need to compromise . . . the EXACT deflection is always available to you. Perfect volume control, equal distribution over the entire register face, "Decorator Gray" finish and prompt deliveries are other features that contribute to total satisfaction.

CONVENIENT CATALOG GIVES COMPLETE DETAILS AND ENGINEERING DATA. AVAILABLE FROM H&C JOBBERS OR DIRECT FROM US.

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WORLD'S LARGEST PRODUCERS OF REGISTERS and GRILLES

MEMBER INDOOR COMFORT

Los Angeles County Engineers Building

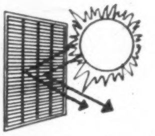
SAVES $13,300 in AIR CONDITIONING with KOOLSHADE SUNSCREEN

Problem: The Los Angeles County Engineers Building was to be air conditioned. The building was equipped with Venetian blinds, but the engineers investigated several other window-shading devices in search for one that would do a better job of cutting air conditioning requirements.

Solution: Tests proved that solar heat transmission through the blinds—even when tightly closed—amounted to 1,102,000 BTU's. With KoolShade, only 232,000 BTU's. In refrigeration requirements, the difference amounted to 72 tons! Costwise, this reduction in tonnage adds up to a net saving of $13,300 over and above the cost of the KoolShade . . . and to this must be added the substantial annual savings from lower operation and maintenance of the cooling equipment.

By keeping the heat and glare of the sun *outside* the building, KoolShade Sunscreen eliminates hot spots and excessive loads . . . provides a balanced and trouble-free installation.

Only KoolShade Sunscreen offers



- **unsurpassed shading efficiency**—keeps up to 87% of the sun's rays off windows during the hottest part of the day—100 sq. feet of KoolShade reduces air conditioning load 1 ton.
- **80% clear visibility**—admits maximum glareless light.
- **harmony with all architecture**—improves building's appearance.
- **virtually no maintenance**—constructed of strong preoxidized bronze strips, wired and framed together, lasts for years, withstands hard blows.

Send today

for this detailed and illustrated bulletin. And for expert help in cutting costs and sun problems, just request a call from a KoolShade engineer. No obligation or charge.

Distributor franchise still open in many communities for those who qualify.

KOOLSHADE®

REFLECTAL CORPORATION
A subsidiary of Borg-Warner Corp.
310 S. Michigan Ave., Dept. K-36,
Chicago 4, Ill.

We'd like to know more about KoolShade. Without obligation, please send:
☐ Free literature
☐ Free sample

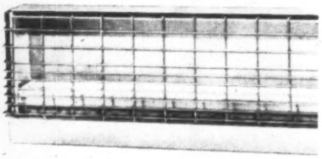
Name ____________ Title ____________
Company ____________
Address ____________
City ____________ Zone ______ State ____________

EQUIPMENT DEVELOPMENTS

Continued

Pipe Threading Machine Co., Dept. HPAC, 1445 Summit St., Toledo 4.

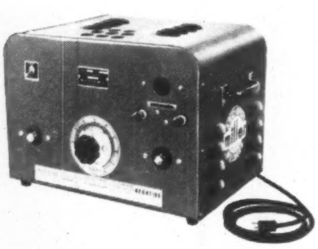
Finish is said to make "No. 68" easier to clean, maintain. Drive is basically worm and ring gear assembly housed in lightweight frame, powered by ½ hp, 110 volt motor or 90 psi air motor. Recommended by company for pipe and conduit threading, pulling, lifting and turning, other uses where portable power is required.



Radiant Baseboards . . .

. . . with high efficiency element—*Ampere Industries, Dept. HPAC, 60 Boston St., Newark 3, N.J.*

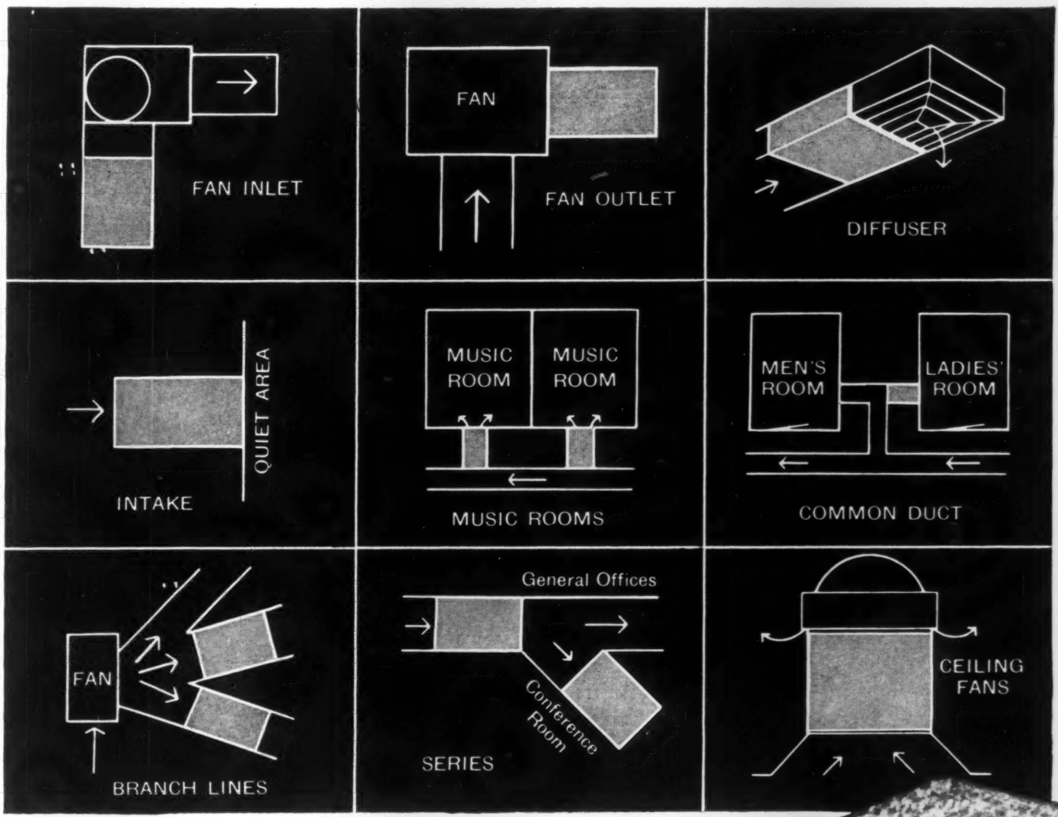
"Amp-Quartz" element is said to have radiant efficiency of over 91 percent, be transparent to infrared rays. Baseboards available in 600, 1000, 1500 watt ratings. Featuring dual voltage, may be used on 120 or 240 volt circuits, says company.

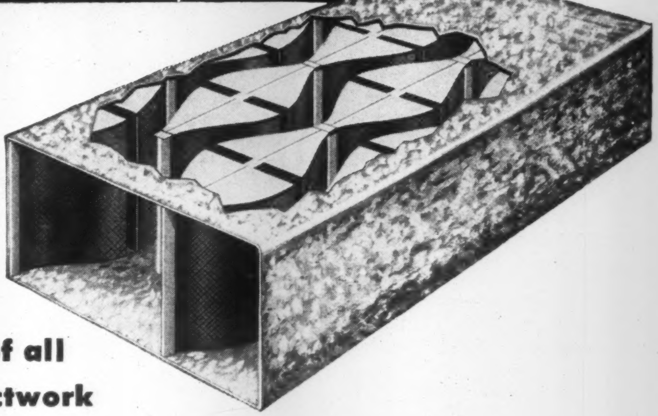


D-C Welder . . .

. . . in compact, lightweight, rectifier type design — *Miller Electric Mfg. Co., Dept. HPAC, Appleton, Wis.*

"SR-10" designed to bring advantages of tungsten inert gas welding to those working with light gage, but hard to weld, metals, says company. Initial impact of full 15 ampere current is said to assure prompt arc starting with flexible downward range to 2.5 amperes.


FAN INLET
FAN
FAN OUTLET
DIFFUSER
INTAKE
QUIET AREA
MUSIC ROOM
MUSIC ROOM
MUSIC ROOMS
MEN'S ROOM
LADIES' ROOM
COMMON DUCT
FAN
BRANCH LINES
General Offices
Conference Room
SERIES
CEILING FANS



Every Building Needs *Aircoustat* Sound Traps

AIRCOUSTAT silences all noise of all frequencies traveling through ductwork

Eliminate disturbance, distraction and irritation caused by noises escaping from one area to another through ductwork.

Install AIRCOUSTAT Sound Traps. AIRCOUSTAT eliminates guesswork, wasted space and unnecessary expense of duct lining. You can guarantee your client trouble-free performance. You can estimate with complete confidence the performance of particular applications. If AIRCOUSTAT fits geometrically, it fits acoustically.

AIRCOUSTAT saves you space. Its greater effectiveness permits smaller-sized ducting. It eliminates bulky mufflers.

For more details, write to KOPPERS COMPANY, INC., Industrial Sound Control Dept., 6208 Scott Street, Baltimore 3, Md.

KOPPERS

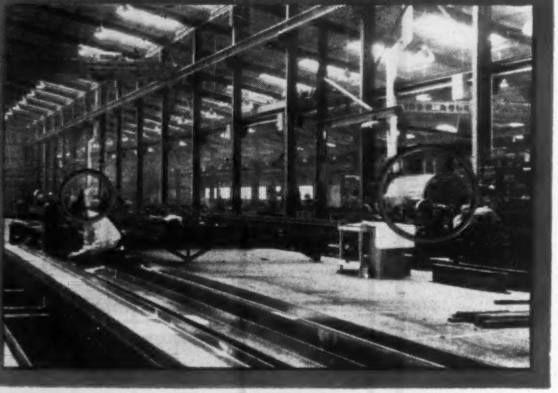
INDUSTRIAL SOUND CONTROL

Engineered Products Sold with ***Service***

Leading builder selects

CARRIER HEAT DIFFUSERS

...for own building

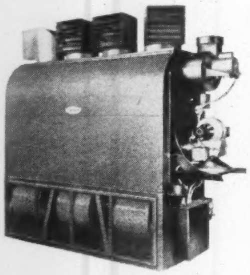


Luria Engineering Company knows heating efficiency. To heat the two million cubic feet of storage and production space in its Chicago plant, Luria chose six 46AF Carrier Heat Diffusers—each with one million BTU output.

Compact Carrier Direct Fired Heat Diffusers are completely self-contained. Stainless-steel combustion chamber, burner, heat interchanger, air handling equipment, and controls are all in a single casing. They cut heating costs three ways: 1. Cost less to own because they do the job of several smaller units. 2. Cost less to install because no central boiler is required. 3. Cost less to operate because of high efficiency.

Amazingly versatile, they can be floor mounted, ceiling mounted, wall mounted, or installed with ducts—installed vertically, horizontally, upside down. Available for all types of fuel combinations. 10 sizes. 300,000 to 2,000,000 BTU's. Carrier has heaters for all applications: call the Carrier Manufacturer's Agent listed in your Classified Telephone Directory under "Heaters—Unit." Or write Carrier Corporation, Department UH, Syracuse, N. Y.

- combustion chamber is 309 stainless steel
- cylindrical chamber for quiet combustion
- non-clogging, long-life exchanger tubes
- forward curve fan blade, powerful diffusion
- steel cabinet finished in durable baked enamel
- fiberglass insulation to keep panels cool
- pre-wired, factory-fired before shipment

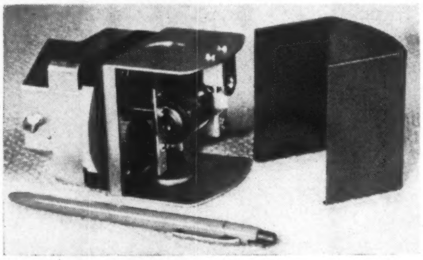


Carrier

industrial heating
air conditioning
refrigeration

EQUIPMENT DEVELOPMENTS

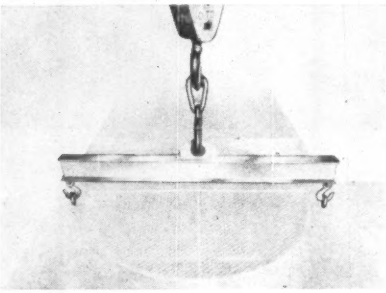
Continued



Miniaturized Photocell . . .

...for small commercial oil burners—*Minneapolis-Honeywell Regulator Co., Dept. HPAC,* 2753 *Fourth Ave., S., Minneapolis* 8.

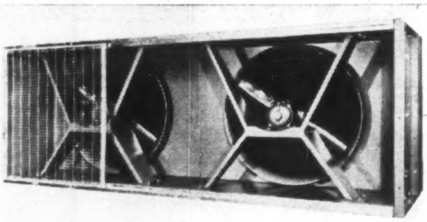
For installations where face plate temperature will not exceed 200 F. Removable slide glass panel allows easy maintenance, eliminates necessity of shutting down burner in order to clean photocell, says company. External mounting is said to prolong life expectancy. Tapped for mounting on 1¼ in. pipe.



Hoisting Yoke . . .

...engineered to simplify shipping, installation of cooling towers—*Havens Cooling Towers Div. of Havens Structural Steel Co., Dept. HPAC,* 1713 *Crystal Ave., Kansas City* 26, *Mo.*

Furnished with each of company's "Verti Flow" tower (80 to 200 tons). Hooked onto eyebolts in top of tower. Quickly detached after tower is in permanent position, says manufacturer.



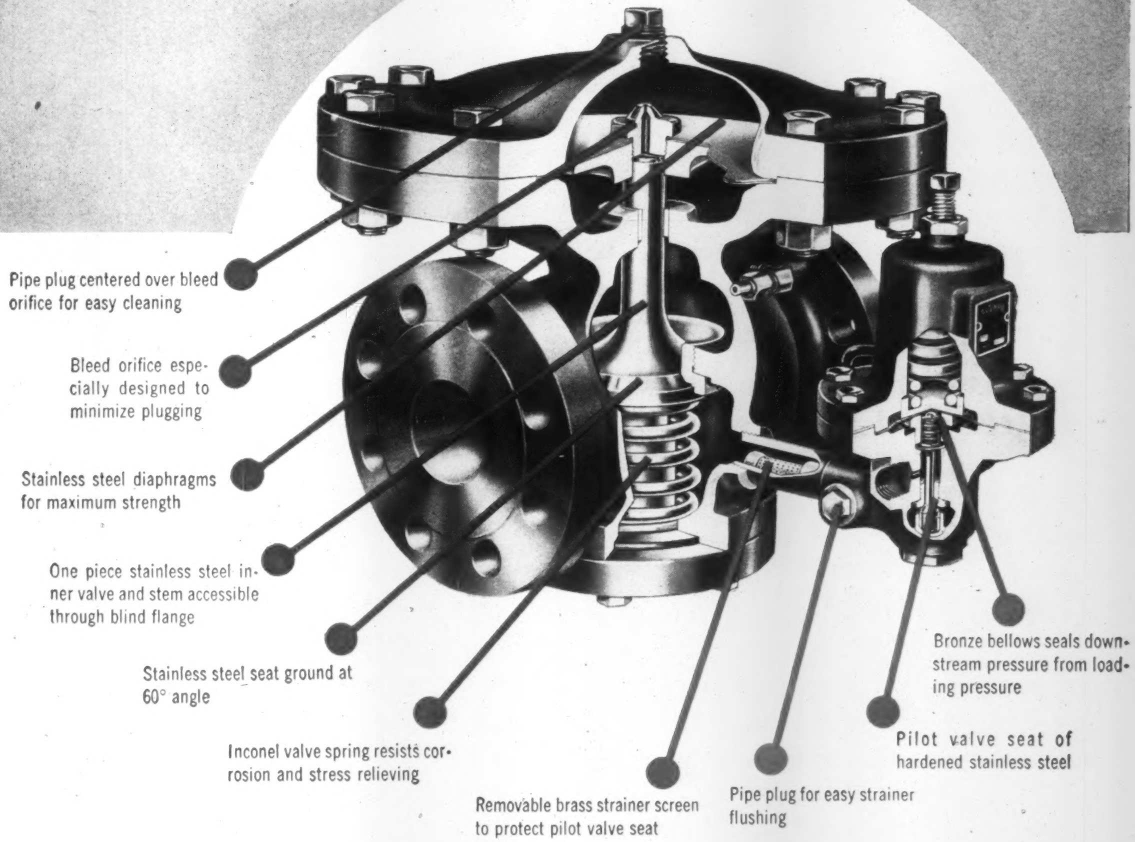
Heat Exchanger . . .

...for installations requiring cooling of liquids or condensing vapors in chemical process, industrial or power applications—*Niagara Blower Co., Dept. HPAC,* 405 *Lexington Ave., New York* 17.

THE FISHER® 92B

IMPROVED

TO MINIMIZE PROBLEMS INHERENT IN STEAM SERVICE



Pipe plug centered over bleed orifice for easy cleaning
Bleed orifice especially designed to minimize plugging
Stainless steel diaphragms for maximum strength
One piece stainless steel inner valve and stem accessible through blind flange
Stainless steel seat ground at 60° angle
Inconel valve spring resists corrosion and stress relieving
Removable brass strainer screen to protect pilot valve seat
Pipe plug for easy strainer flushing
Pilot valve seat of hardened stainless steel
Bronze bellows seals downstream pressure from loading pressure

Not content with the enviable performance record of the Type 92A, Fisher engineers have improved this pilot operated pressure reducing valve to a new peak of performance.

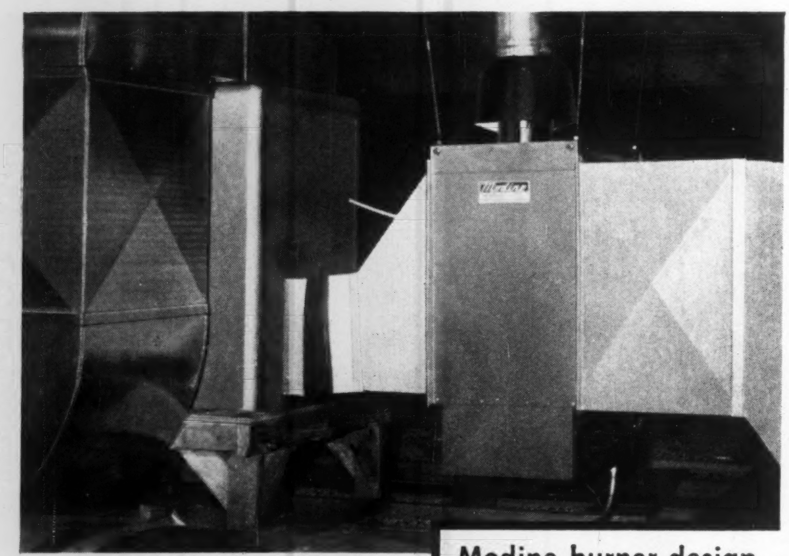
For extremely accurate, long trouble-free service, put a Fisher 92B in the line. One pilot with three interchangeable springs provides a range of from 2 to 150 psi. • *Send for Bulletin D-92 today.*

Engineers with special problems . . . find the ***answer*** *in . . .*

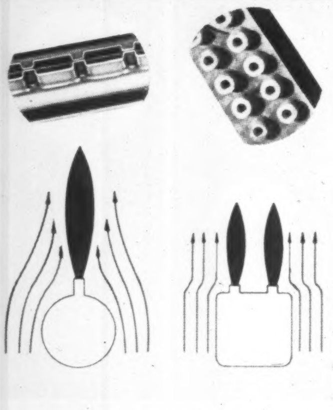
FISHER® Controls

FISHER GOVERNOR COMPANY
Marshalltown, Iowa / Woodstock, Ontario

Never rusts or corrodes, offers amazing installation flexibility



Modine burner design prevents clogging . . . assures clean burning



Modine ports have four times the free area of drilled ports. Sharp edges resist lodging of scale, and single-row arrangement assures maximum combustion efficiency.

Modine stainless steel gas-fired duct furnace

This versatile furnace is especially suitable for use with cooling coils and packaged air conditioners. Stainless steel burners and heat exchangers prevent the rust and corrosion problems of conventional units. What's more, compactness and light weight allow easy, low-cost shipping and installation.

Check these Modine PLUS features

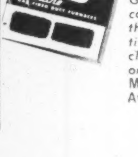
Fast, uniform heat is assured by direct firing of each seam-welded, gas-tight heat exchanger tube.

Convenient controls are mounted on side of unit for easy access regardless of furnace location.

Removable burner permits easy inspection and maintenance.

Five sizes are available from 88,000 to 213,000 Btu/hr input.

Wide application — Ideal as central heaters . . . boosters . . . with air conditioners . . . and for industrial and agricultural drying, processing and ventilating.



Get Bulletin 855 for complete details. Call the Modine representative listed in your classified phone book or write Modine
Mfg. Co., 1509 DeKoven Ave., Racine, Wis.

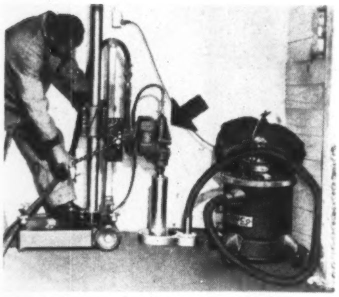
Modine
MANUFACTURING COMPANY

D-1349

EQUIPMENT DEVELOPMENTS

Continued

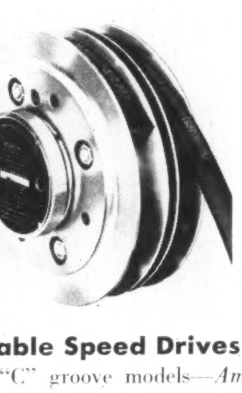
"Aero" consists of arrangement of heavily finned tubes in casing through which air is drawn by two propeller type fans. Heat transfer is from fluid through tube walls and extended surfaces to air that is exhausted into atmosphere. In four standard sizes. Can be stacked vertically or horizontally in multiple unit installations, says company.



Compressed Air Motor . . .

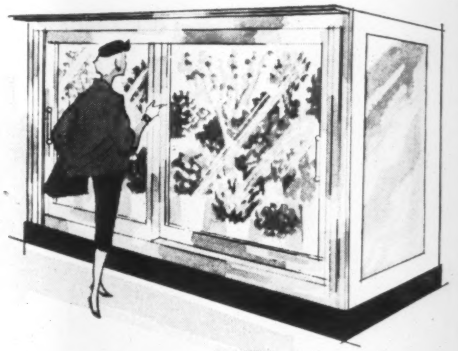
. . . for diamond drilling without electric power—*Wheel Trueing Tool Co., Dept. HPAC, 3200-182 W. Davison, Detroit 38.*

Developed to meet demand for diamond drilling equipment that could be used in many applications that occur in areas beyond power line, says company. Motor develops 4½ to 5 hp and can be operated from standard compressor unit developing 90 psi of air at approximately 90 to 95 cfm. Drills hole sizes 3 to 14 in. diameter.

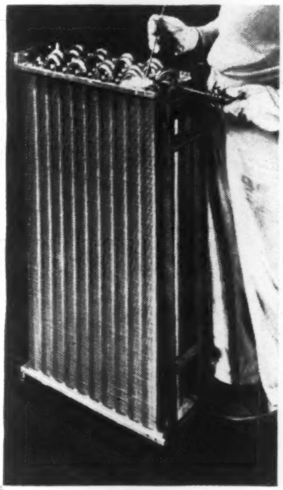


Adjustable Speed Drives . .

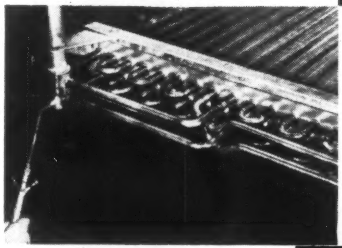
. . . in 2 "C" groove models—*American Pulley Co., Dept. HPAC, 4200 Wissahickon Ave., Philadelphia.*



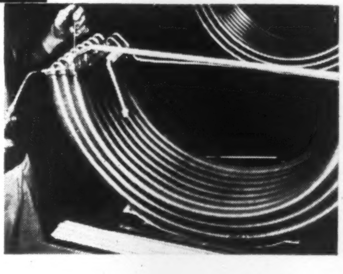
JOIN WITH HANDY & HARMAN SILVER BRAZING FOR PERMANENT PROFIT



Operator brazing copper return bends on TV 210 Evaporator. Used in "L" Thermobank Defrosting System. Operator sets up and brazes 38 joints with SIL-FOS 5 in 30 minutes, using oxyacetylene fuel.



Brazing "Unicon," Air-Cooled Condenser, Model BD 3200 Coil. Each assembly has 40 joints at each end. Brazing time with SIL-FOS and oxyacetylene fuel, including setup time: 1 hr. 15 minutes.



C-208, Large Curvette. Brazing heat exchanger and distributor to coil. Used in evaporators for meat storage and other applications. Each end has 24 joints brazed with SIL-FOS 5.

How Kramer Trenton Produces Complex Assemblies at Low Cost . . .

BRAZING WITH SIL-FOS 5

First a SIL-FOS user and now a SIL-FOS 5 booster, Kramer Trenton Company puts this economy brazing alloy to work on a wide variety of refrigerating and air-conditioning components with gratifying success.

The outstanding performance of Kramer Trenton units in the field can be traced right back to good shop practices, quality materials and expert workmanship. In the brazing operation, they know they can depend on SIL-FOS and SIL-FOS 5 to give them sound, leak-tight joints for the life of the equipment. They know, too, that the SIL-FOS alloys are uniform in melt and flow characteristics, give instant penetration and provide smooth fillets. These and other benefits quickly add up to maximum production at minimum cost.

Handy & Harman field engineering service stands behind every ounce of brazing alloy we produce. Call on us for the help you need in designing for silver alloy brazed construction or in applying Handy & Harman alloys to your production requirements. We will work with you all the way.

START WITH BULLETIN 20

It tells you why and how high speed, strength and economy are inherent in silver alloy brazing. Gives information on joint design and brazing methods. A copy is yours for the asking.

EASY-FLO
SIL-FOS

Your NO. 1 Source of Supply and Authority on Brazing Alloys

HANDY & HARMAN FOUNDED 1867 QUALITY SERVICE

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General Offices: 82 Fulton St., New York 38, N. Y.

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More Steam

Faster and Cheaper

plus

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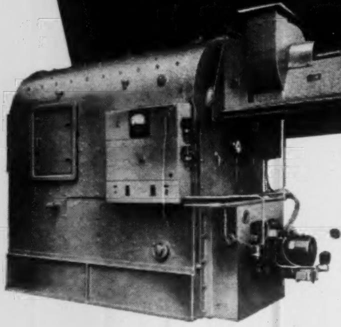


. . . International

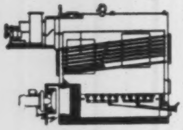
Water Tube

Package Boilers

Combine the proven advantages and economies of International water tube boiler design . . .

- **Ample Furnace Volume—low heat release rates**
- **Reserve Capacity Always Available**
- **Maximum Heat Absorption—quick steaming**
- **Induced Draft—quiet operation**

with fully coordinated burner and controls, and you have an International Water Tube Package Boiler



Shipped as a complete unit for oil, gas or combination firing, this firebox boiler can be easily converted to coal firing at any time.

International Package Boilers can also be shipped, less burner and controls, for installation by local contractors in accordance with International's package boiler specifications.

Get the full story on International Water Tube Package Boilers. Write today for Bulletin 600.

Exclusive territories open to experienced sales organizations. Write stating qualifications.

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BOILER BUILDERS SINCE 1886

THE INTERNATIONAL BOILER WORKS CO.

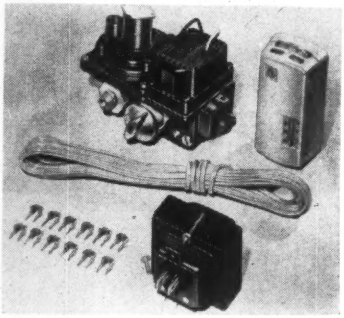
Steel Firebox Heating & Power Boilers
Low & High Pressure Water Tube
Package Boilers • International-
LaMont Forced Recirculation Generators • ASME Code Pressure
Vessels & Welded Products.

810 Spruce St.
East Stroudsburg, Pa.

EQUIPMENT DEVELOPMENTS

Continued

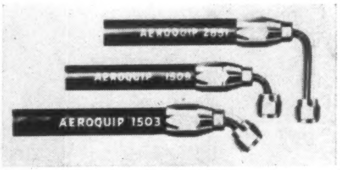
Units are said to permit stepless speed adjustments to 26 percent. Pitch diameters are 8.5 to 10.7 in., 9.5 to 11.7 in., 10.5 to 12.7 in.



Gas Control . . .

. . . for unit heaters — *A-P Controls Div., Controls Co. of America, Dept. HPAC, 2450 N. 32nd St., Milwaukee 45.*

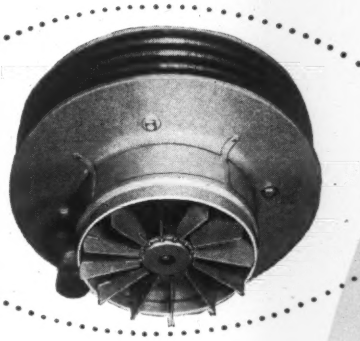
"Model 5010" features silent operation, safe lighting, complete shutoff, says company. Is said to do work of five individual controls. Designed for use with all gases for accurately regulated flow. With built-in pressure regulator for all gases, or without for LP gas. Available in range of inlet, outlet sizes with side, bottom or straight-through outlets optional.



Hose Elbow Fittings . . .

. . . designed to simplify hose installation in confined spaces, reduce number of joints and fittings required—*Aeroquip Corp., Dept. HPAC, Jackson, Mich.*

Cited advantages: less flow restriction, greater space saving, re-usability of fittings. Fabricated from formed tubing. Available in swivel nut ends with JIC and SAE threads. In 45 and 90 deg configurations. For use with company's medium and high pressure hose.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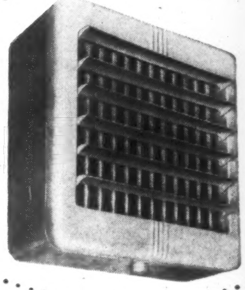
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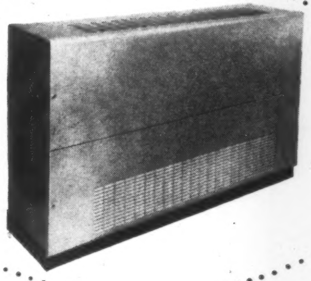

3

McQuay

UNIT HEATERS

For EVERY Need

AND ALL WITH

RIPPLE FIN COILS

McQuay Unit Heaters have modern styling. The attractive cabinets are finished in neutral hammer enamel and blend in well with all surroundings. They are available in an exceptionally wide range of sizes and capacities for either steam or hot water, to enable you to meet the requirements of every job—old or new, large or small. McQuay Unit Heaters will solve any low cost heating problem anywhere, with uniform and quiet delivery of heat and with that extra efficiency afforded by Ripple Fin Coils. Years of experience, years of research provide the know-how for which McQuay is famous.

Means **Q**uality — McQuay

1 **DOWN FLOW UNIT HEATERS** Capacities from 38,500 to 500,000 BTU/hr. For steam or hot water. Adjustable radial diffusers furnished with each unit. Four types are available.

2 **HORIZONTAL UNIT HEATERS** Capacities from 17,700 to 360,000 BTU/hr. For steam or hot water. Adjustable louvers standard equipment. Double deflection grilles available on special order.

3 **CABINET UNIT HEATERS** Capacities from 19,700 to 108,000 BTU/hr. For steam or hot water. Designed for fully exposed, semi-recessed or fully recessed mounting on either floor, wall or ceiling.

McQuay INC.

N E S W

MAKE THE SEASONS COME TO YOU

REFRIGERATION
HEATING
AIR CONDITIONING

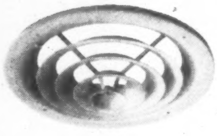
McQuay, Inc., 1601 Broadway St. N.E., Minneapolis, Minnesota. *Representatives in all principal cities.*

REGISTERS ARE THE SHOWPIECES OF THE JOB!

You use great care in the engineering and installation of your heating and air conditioning equipment. Yet most of the items are hidden from the homeowner's view—in the attic, closet or basement.

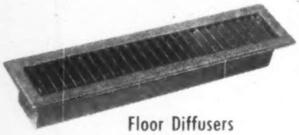
Only the registers are in plain sight in every room in the home at all times. So it is important to be sure the registers reflect the true quality of the installation. These "showpieces of your job" should not only be better in design and performance, but also superior in beauty and strength.

That's why selling Lima Registers to your prospects will actually help you sell more complete heating and air conditioning jobs. Ask us for the Lima Quality and Performance Story. It will help you make more sales.

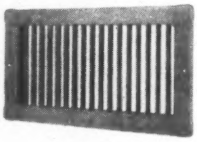


Ceiling Diffusers

Baseboard Diffusers

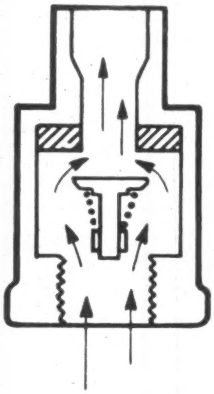


Floor Diffusers



Air Conditioning Grilles, Valves

Lima REGISTER COMPANY
1796 N. Cable Rd. Lima, Ohio
sold exclusively through wholesalers and manufacturers



Pneumatic Coupling . . .

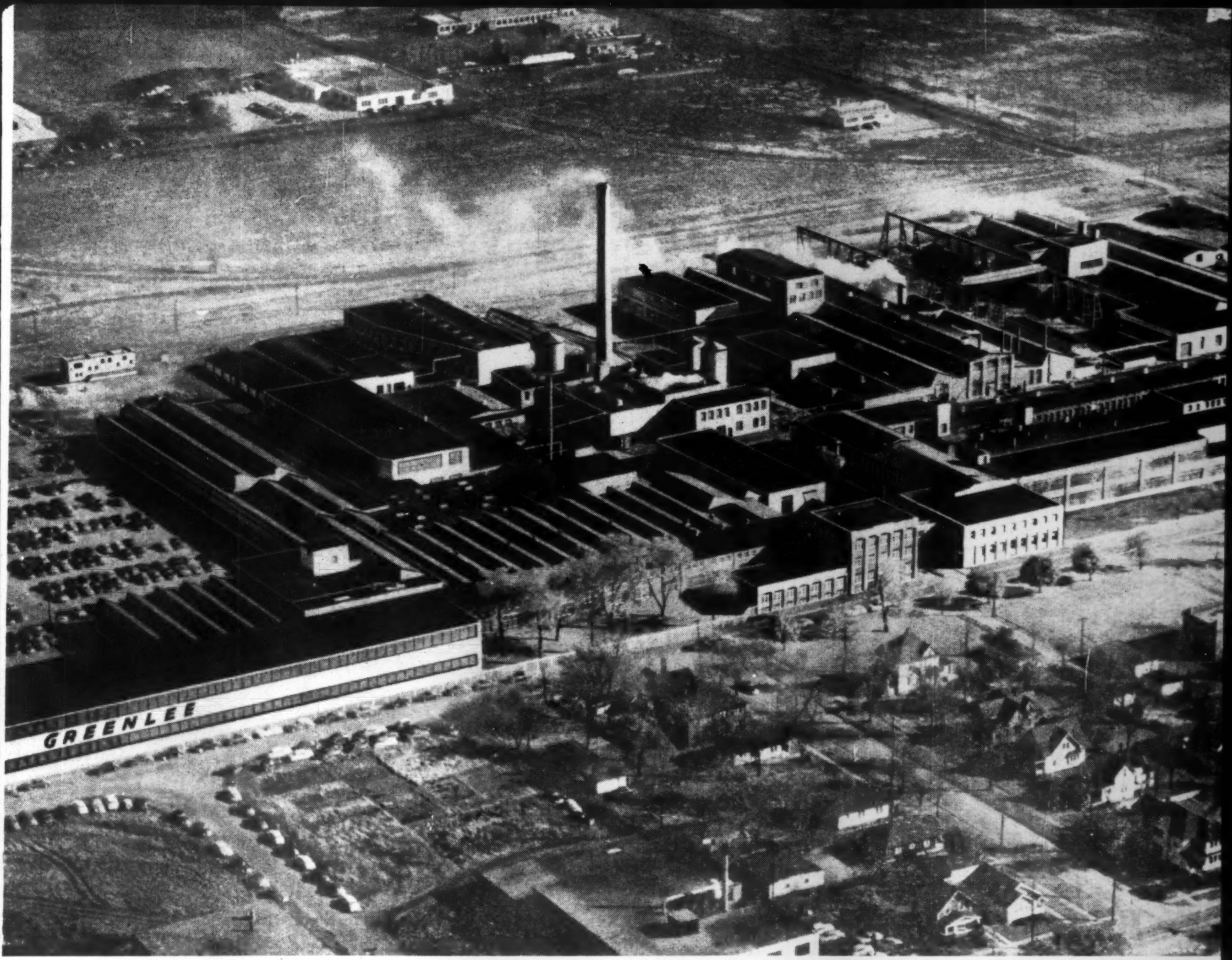
. . . designed to direct air flow around spring when it is compressed instead of through it—*Zalo Mfg. Co., Dept. HPAC, 4893 Van Epps Rd., Cleveland 9.*

Feature is said to permit air flow of better than 60 cfm at 100 psi in $\frac{1}{4}$ in. size. "PT" series also available in $\frac{3}{8}$ in. size which permits flow of better than 100 cfm at 100 psi, says company.

Fans . . .

. . . in new line of "Mancoolers" and portable utility models—*Aerovent Fan Co., Inc., Dept. HPAC, Piqua 29, Ohio.*

Group of all purpose fans for industry, comprising five heavy duty units for spot cooling, drying or processing, in all types of portable or stationary applications, includes lightweight "Model 39" with cast iron or rubber tired wheels, portable "Model 56" with column and large pedestal, stationary heavy-duty



Greenlee cuts steam costs 18%-20% burning coal the modern way

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

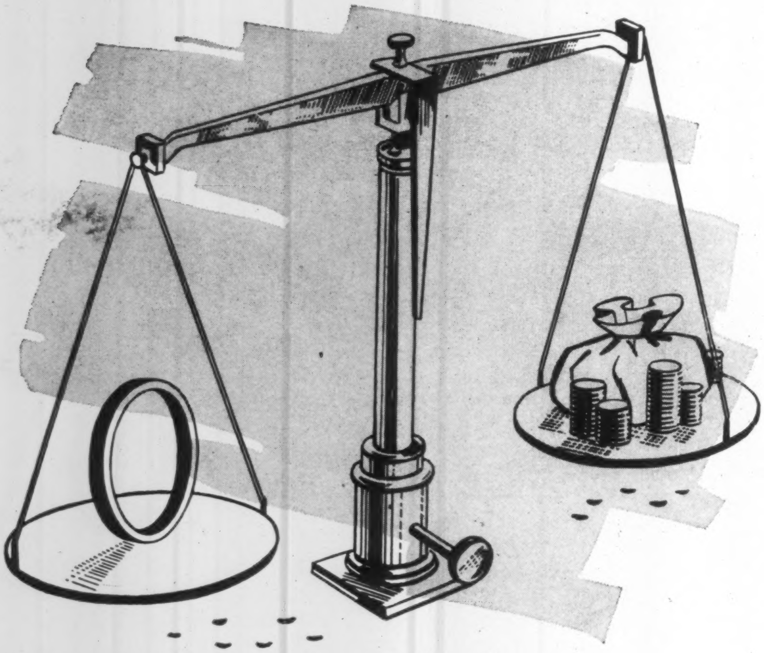
Expanding facilities at Greenlee Bros. & Company, Rockford, Illinois, created a problem common to many growing firms. The Company's three old boilers had to operate continually at maximum capacity, so that a forced outage could hurt plant production. In addition, peak load operation with outmoded equipment resulted in high fuel costs.

While the newest boiler was retained, Greenlee replaced the other two with modern high-capacity units, including stokers, up-to-date controls and other equipment for more efficient operation. A new, pneumatic ash handling system was installed. Today Greenlee is getting 10%-20% more steam for each pound of coal burned and steam costs are down 18%-20%, saving Greenlee thousands of dollars every year.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

BITUMINOUS COAL INSTITUTE

Southern Building • Washington 5, D. C.



THE WORLD'S MOST EXPENSIVE PIPING!

- Less than an inch may cost thousands of dollars.
- No one orders it, yet it appears in every installation.
- It can be measured but not located.
- When opposed it can exert sufficient force to buckle the toughest steel.
- Its presence is often accompanied by distracting noise and vibration.

It is of course, the amount of thermal expansion in heating and piping systems.

La Favorite reinforced all-rubber expansion joints are the most practical means yet devised to eliminate damage and noise caused by thermal expansion, contraction and vibration. Because they compensate, because they are corrosion-free, because they have no moving parts to wear, your piping is kept safe and silent indefinitely.

For a more complete story on La Favorite's "*know-how in rubber*" send for your copy of Bulletin 55. Additional personal service is as near to you as your telephone.

LA FAVORITE *Rubber Mfg. Co.*

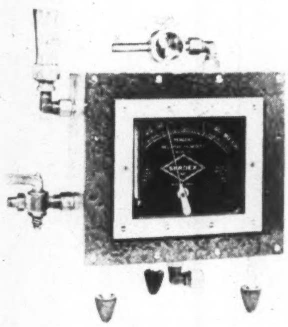
256 Wagaraw Road • Hawthorne, New Jersey

676

EQUIPMENT DEVELOPMENTS

Continued

"Model S" and "Steeler" designed expressly for steel industry, says company. Available in sizes 24 to 48 in. Portable utility fan offered in sizes 16 to 36 in.



Humidity Indicator . . .

. . . for measuring humidity of closed areas—*Serdex, Inc., Dept. HPAC, 91 Cambridge St., Boston 14.*

Recommended by company for laboratory, plant operations. Indicator can be located in office, laboratory or control room away from area to be measured. Air line is run into area to be sampled. Vacuum pump or line draws sampled air through indicator.

Vacuum Cleaning System

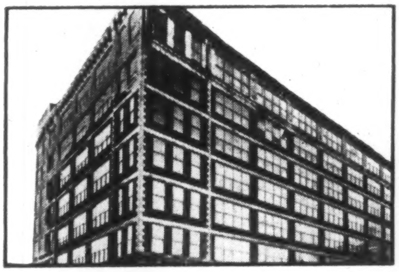
. . . for boiler and furnace cleaning, removing dirt from ducts and piping, cleaning filters, other cleaning operations in heating, ventilating, air conditioning fields—*Kent Co., Inc., Dept. HPAC, 716 Canal St., Rome, N.Y.*

"Turbo-Vac" unit may be used as either complete unit for ordinary

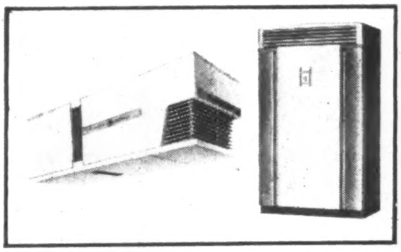
Air Conditioning *at low cost* in a men's clothing factory, with its many batteries of steaming presses, was considered impractical—until General Electric Zone-by-Zone Air Conditioning solved the problem for H. Daroff & Sons, Philadelphia, manufacturers of Botany "500" and Worsted-Tex clothing. Note that General Electric Ceiling-Mounted Units take no floor space—require little or no ductwork.

General Electric Zone-by-Zone Method

selected for world's first fully air conditioned men's clothing plant



H. Daroff & Sons, Phila., first plant of its type to be fully air conditioned — thanks to General Electric Zone-by-Zone method.



CEILING-MOUNTED UNITS (left). Use no floor space — air-cooled and water-cooled.

FLOOR-MOUNTED UNITS (right). May be stationed in space or away from area served.

The H. Daroff and Sons plant is a typical example of how General Electric Zone-by-Zone Air Conditioning fully meets requirements for any type of factory or office building—even overcomes seemingly insurmountable problems. This system is also a sure way to solve budgeting problems. It is easy to install — no costly interruptions — no major alterations — no heavy initial outlay. Its operation is economical, and it minimizes the problem of space.

More and more architects are specifying General Electric Zone-by-Zone Air Conditioning as the most practical answer for every requirement. General Electric Company, Commercial and Industrial Air Conditioning Dept., 5 Lawrence St., Bloomfield, N. J.

Progress Is Our Most Important Product

GENERAL ELECTRIC

In Canada, Canadian General Electric Co., Ltd., Montreal

GREEN SURE SEAL*

AIR FILTER

BUILT-IN CONTROLS

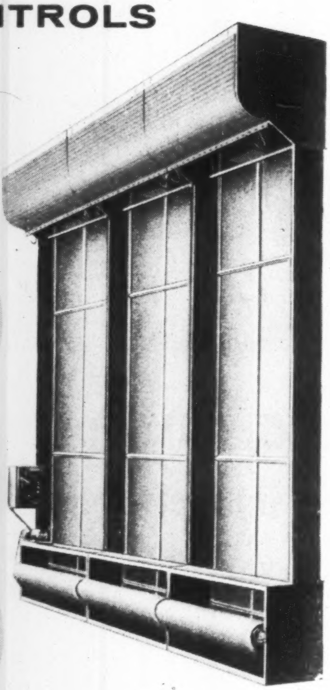
2 Types

1

Timed Intervals, changing the filter media at predetermined intervals; timing can be changed at will to meet changing conditions.

2

Pressure Differential, changing the filter media whenever clogging raises the pressure differential above a predetermined amount.



Either way, the controls go with the Filter, all assembled and incorporated with it.

Couple either of these sure controls with the proved filtration efficiency and you have an air filter that you can install, push the button and it will go to work and stay at work without attendance until the roll of fresh filter media is used up. Changing the roll which is very easy and a periodic checking to be sure the controls are set for desired conditions are about all you have to do.

You can have confidence in the Green Line of products—which have been world-wide since 1845.

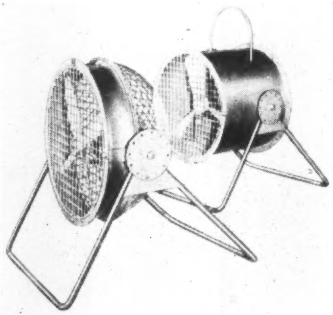
Clean Air
GREEN'S AIR FILTER

If you are bothered with contaminated air get all the facts concerning the GREEN Sure Seal AIR FILTER. Bulletin 175 gives the details.

*U. S. Patents Pending

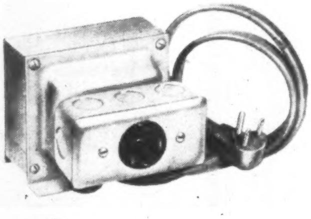
THE GREEN
POWER AND PROCESS PLANT EQUIPMENT
FUEL ECONOMIZER COMPANY INC.
BEACON 3, NEW YORK
Representative in Principal Cities

light cleaning operations, or head only and "Drum-Seal" may be used as team. In four models, with tank capacities from 2/3 bu or 5 gal to 1 2/3 bu or 10 gal.



Cradle Mounted Fans . . .
. . . for product cooling, man cooling, drying, recirculation, elimination of air stratification, similar applications —*Propellair Div. of Robbins & Myers, Inc., Dept. HPAC, Springfield, Ohio.*

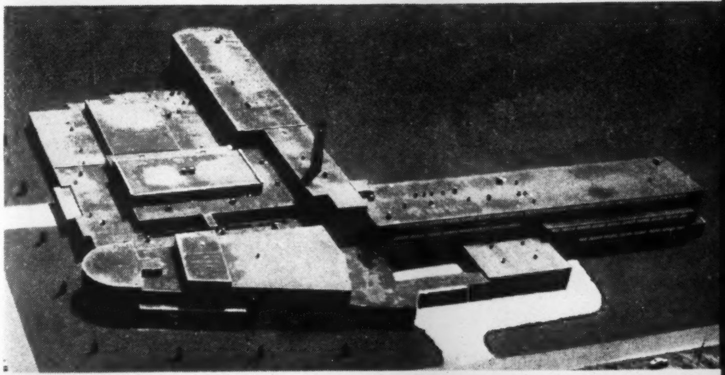
In five sizes 16 to 36 in. With air delivery ratings to 18,700 cfm. Available with either venturi entrance ring or tubeaxial construction. Wire safety guards on both sides of fan are standard equipment.

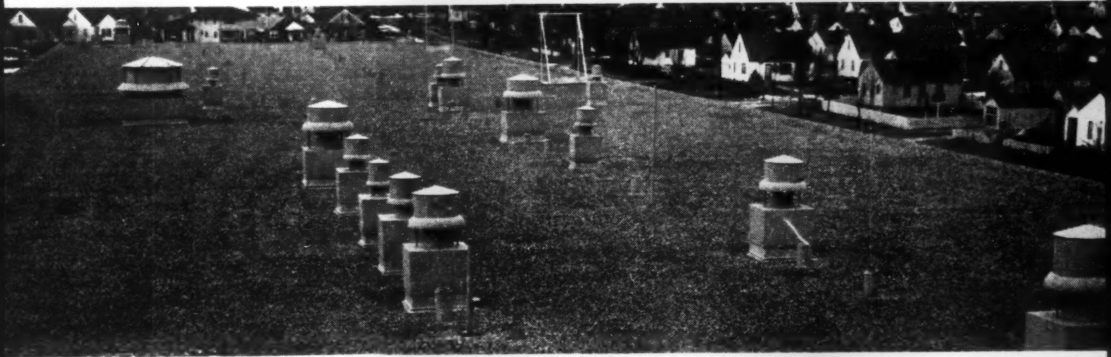


Transformers . . .
. . . for air conditioners—*Chicago Standard Transformer Corp., Dept. HPAC, 3501 W. Addison St., Chicago 18.*

Step-up/step-down units designed for converting 208 volt circuits to 230 volt lines. Converting from 230 volt unit to 208 volt line accomplished by change of connections inside outlet box. In two models for air conditioners using ½ to 1 hp and 1 to 2 hp motors.

St. Louis Park, Minn. High School
G. M. Orr Engineering Co., Minneapolis, Minn.
Consulting Engineers for School District
Bissell & Belair, Minneapolis, Minn.
Architects
D'Arcy Leck Construction Co.
General Contractor
Egan & Sons
Mechanical Contractors





Certified Ratings
PFMA

150 CFM to 65,000 CFM—up to 4" S.P. Certified Ratings.

48 Gallaher Air-Vans® *Ventilate this $3,250,000 St. Louis Park, Minnesota Jr.-Sr. High School*

"We've had very good success with Gallaher Equipment," said G. M. Orr, M.E. "In all public works, we have to recommend several types to the contractor, but we like Gallaher very much and always recommend them."

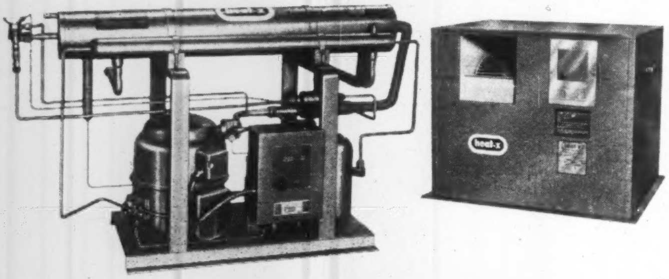
The 48 Air-Vans (43 Direct Drive and 5 Belt Drive) have proved effective and efficient in operation since the school opened in the Fall of 1956.

Engineers and Architects specify Gallaher Air-Vans for many features — patented scroll effect design, patented air seal-off, low silhouette, low noise level, availability in special metals, weatherproof design, heavy construction, and shipped completely assembled.

For full information on Air-Vans, write to —

The GALLAHER Company
4108 Dodge Street Omaha, Nebraska

Export Office: 306 Paul Bldg., Utica, N. Y.



BOOM FORECAST in RESIDENTIAL AIR CONDITIONING

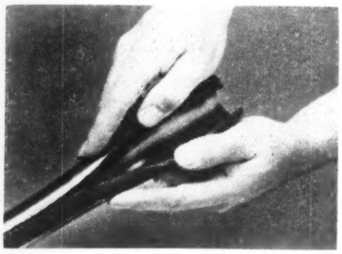
Assure YOUR Profit Share with these NEW heat-x Units

Completely packaged water chillers . . . in 2, 3 and 5 HP models . . . designed for easy, speedy installation that *builds profits.* Available in water-cooled models ('RPC') and air-cooled models ('ARPC'), these new Heat-X units were developed *specifically* for residential and light commercial air conditioning systems.

High efficiency patented Inner-Fin® construction of chillers, superheaters and condensers makes these the most compact units on the market. All water passages are of non-ferrous construction, eliminating corrosion problems.

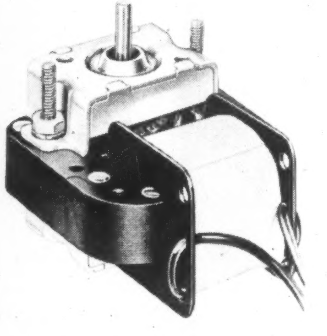
Don't be left behind in the coming residential air conditioning boom. Write today for complete data on 'RPC' and 'ARPC' units.

HEAT-X, Inc.
A Subsidiary of Dunham-Bush, Inc.
BREWSTER • NEW YORK



Plastic Pipe . . .
. . . designed to solve condensation problem on exposed cold water pipes —*Franklin Plastics, Inc., Dept. HPAC, Franklin Park, Pa.*

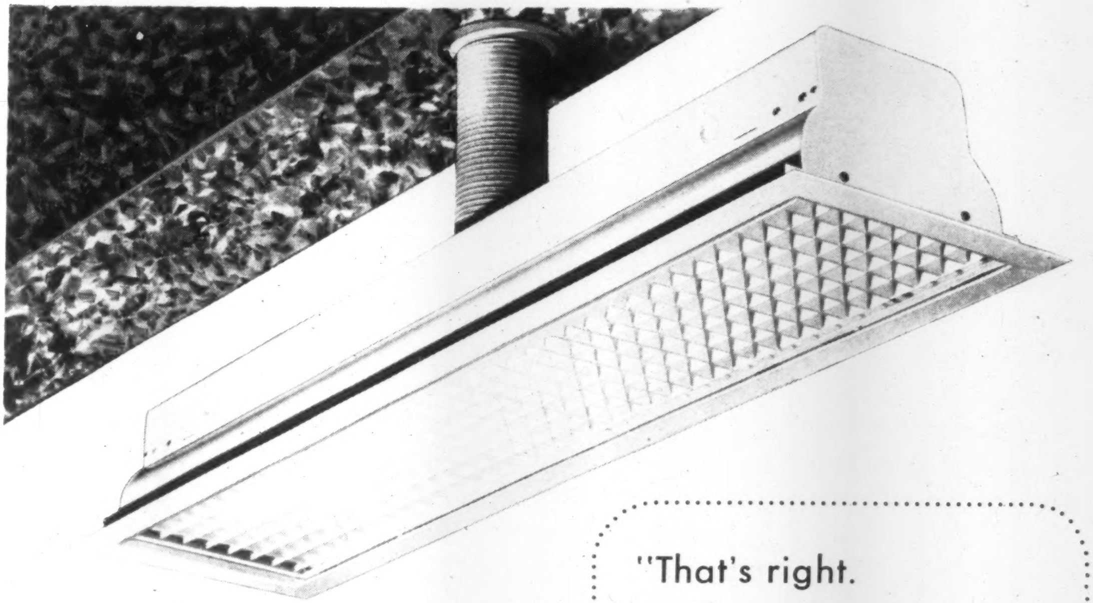
Lightweight, flexible polyethylene "Dur-X" is slit along its entire length and slipped over metal pipe. Simple application means no disruption in water service, says company. Available in sizes ½ to 6 in. IPS, in any desired length.



Shaded Pole Motor . . .
. . . with self lubricating feature *Soreng Sales Div., Controls Co. of America, Dept. HPAC, Schiller Park, Ill.*

"Camel Bearing" design is said to facilitate retaining lubricant "almost indefinitely." Provides automatic, positive oil circulation even under high temperatures, says company. "102" motor recommended by manufacturer for applications where inaccessability, hard use are prime factors. In 12 models.

Gas Detector . . .
. . . for measuring natural gas concentrations—*Johnson-Williams, Inc., Dept. HPAC, 2715 Park Blvd., Palo Alto, Calif.*



"You mean you get both air *and* light from the same unit?"

"That's right. It's the new **MULTI-VENT TROFFER** The air diffuser is completely concealed in the flush light fixture!"

There's more to the new **MULTI-VENT TROFFER** than meets the eye!

It combines a great advance in gently diffused, draft-free air conditioning, with modern, highly efficient lighting at a substantial savings in cost!

Complete concealment of the air diffuser within the handsome light fixture means freedom for the architect to design clean, uncluttered ceilings, greatly simplified mechanical planning for the engineer and . . . for the contractor . . . faster, easier field installation.

Write for detailed literature and the name of the representative in your area.

multi-vent

DIVISION OF
THE PYLE-NATIONAL COMPANY

1373 N. Kostner Avenue, Chicago 51, Illinois

WHERE QUALITY IS TRADITIONAL

Multi-Vent® by The Pyle-National Company—Trofferlite by Benjamin Electric Mfg. Co.

SALES AND ENGINEERING REPRESENTATIVES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

19,862 years of precision metal-forming

Time brings experience . . . experience brings skill . . . and the FLEXON® team of engineers, metallurgists, and technicians have worked a total of **19,862** years perfecting the most skillfully-made expansion joints that can be formed.

These same skills are part and parcel of all Flexonics formed and corrugated tubular shapes in metal—flexible metal hose, instrument-type bellows, "impossible" bends and section modulations for aircraft parts. They assure you expansion joints that you can **install and forget.**

Always specify FLEXON Expansion Joints—free-flexing and controlled-flexing; dual and multiple types; balanced joints and other special designs; all in stainless steel, monel, and other workable alloys. Flexon Expansion Joints last longer on the job—because they are engineered right and made better.

Write today for your copy of the Flexon Expansion Joint Design Guide—28 pages of facts about absorbing pipe motion.

EJ-205

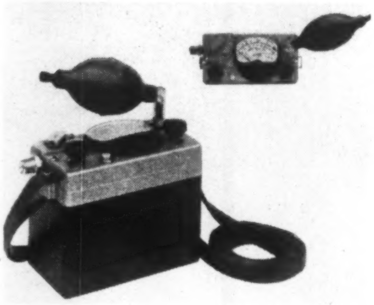
Flexonics
corporation

EXPANSION JOINT DIVISION– 1391 S. THIRD AVE., MAYWOOD, ILL.

EXPANSION JOINTS · METAL HOSE · NON-METALLIC HOSE · BELLOWS · AIRCRAFT COMPONENTS

EQUIPMENT DEVELOPMENTS

Continued



"Gas-Pointer" designed for pinpointing leaks in buried pipelines. Two ranges built into instrument. In low range, meter registers zero to 1.0 lower explosive limit. If concentration is found to be above low range, two-position valve can be turned to zero to 100 percent range for direct reading on second scale.

5 Hp Air Cooled Chiller . . .

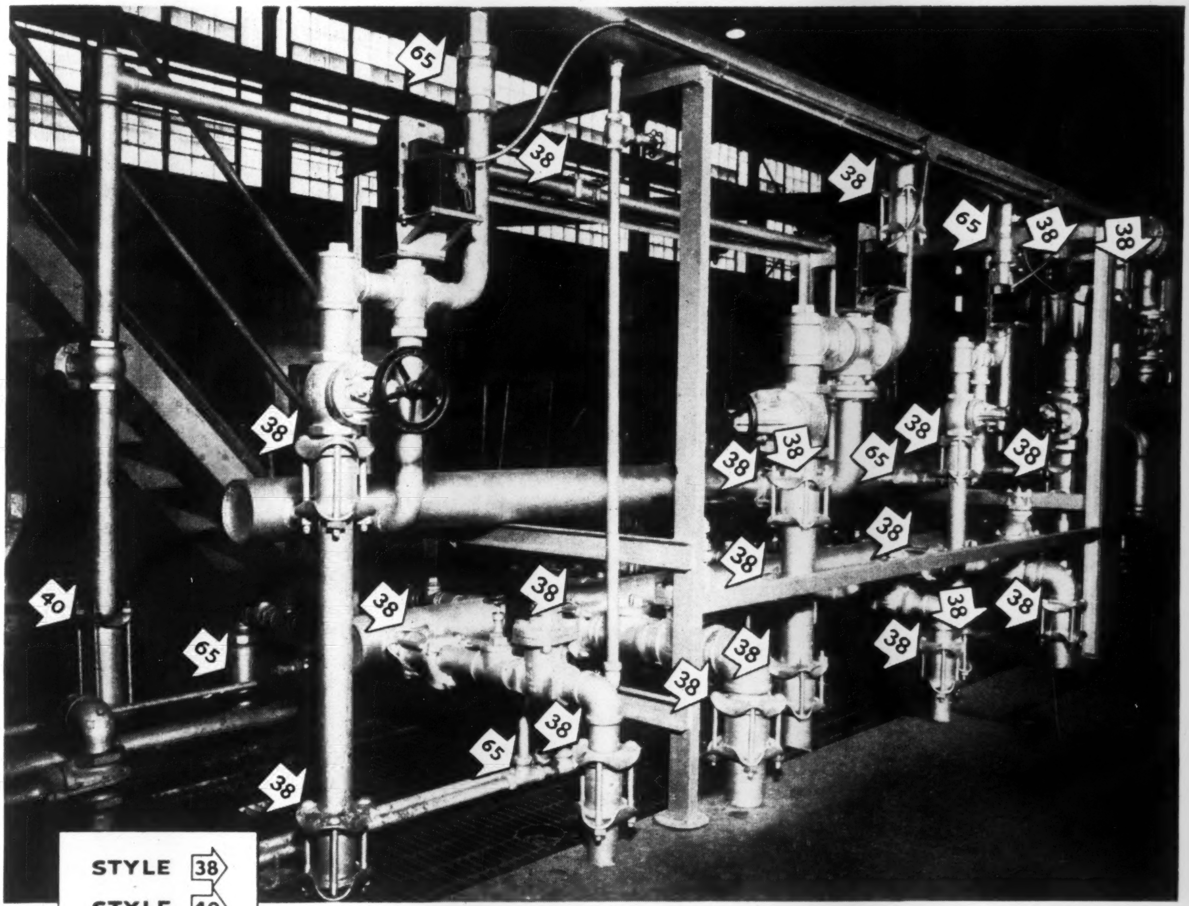
. . . for flexible installation in small commercial applications—*Plumbing and Heating Div. of American-Standard, Dept. HPAC, 40 W. 40th St., New York 18.*

Composed of two compact matching units: evaporator and remote condenser section. Both units factory assembled packages connected during installation by flexible copper tubing by means of breakaway valves, says company.

Pressure-Vacuum Control

. . . with two separate switch actions — *United Electric Controls Co., Dept. HPAC, 79 School St., Watertown 72, Mass.*

Is said to permit control of two independent circuits, extreme flexibility of switch arrangement. With



This picture shows you 26 Ways to Save Time, Labor and Money!

Every Dresser Coupling and Compression Fitting is a way to save money — no threading, no exact pipe fitting, no welding, no grooving, no caulking. (And there are 26 of these money savers in this piping setup alone.)

Take those five Style 65 Dresser Compression Fittings, for instance. You simply stab *plain pipe ends* into the fittings and tighten the end nuts. Time: about 30 seconds per joint!

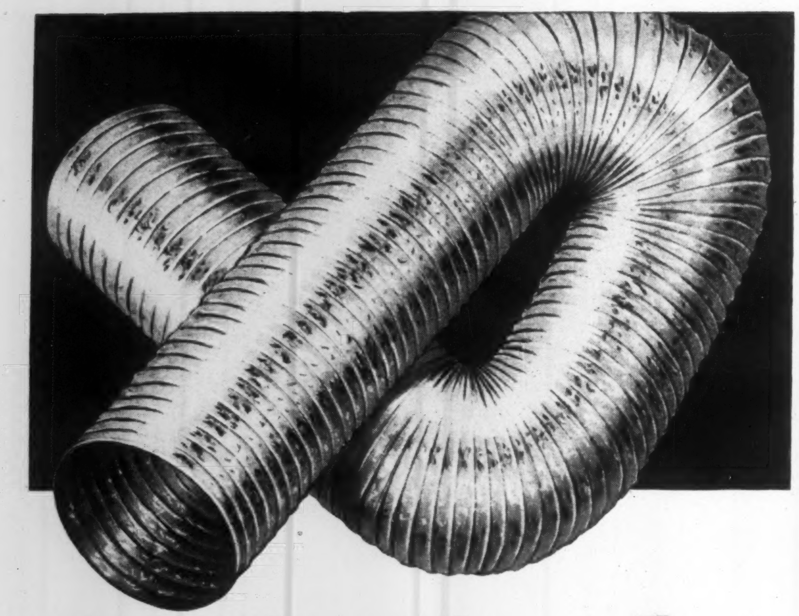
Or take the twenty Style 38 Dresser Couplings (and one Style 40). They're wrench-installed in only two man-minutes per bolt!

For a full range of sizes and shapes . . . save time, save money . . . see your nearest piping supplier.

DRESSER®

Dresser Manufacturing Division, 79 Fisher Ave., Bradford, Pa.
In Canada: Toronto and Calgary.

ONE OF THE DRESSER INDUSTRIES



facts about Thermaflex®

that will help you solve your ducting problems

What is Thermaflex?
A lightweight, flexible ducting made of a spring steel wire helix covered with a three-ply reinforced laminate of woven fiber glass and metallic sheeting.

What are its applications?
Thermaflex is designed to supply air at temperatures ranging from 0°F. to 250°F. It is mainly used as a connector between main lines and diffusers or sound boxes in heating and air-conditioning systems.

What about installation?
It installs faster than rigid ducting at savings up to 32%. One man can do the job without special tools or fittings in just a few minutes.

Is it flame resistant?
Thermaflex will stand 1200°F.* without any sign of combustion or melting. The covering used in its construction is approved by Underwriters' Laboratories, Inc.

What pressures will Thermaflex handle?
25 psi, which is 5 times the minimum standards of the New York Board of Standards and Appeals.

How long will it last in service?
Much longer than rigid metal ducting. It is impervious to moisture, rust, rot, fungus and mildew.

How flexible is Thermaflex?
It takes tight bends with a radius equal to half its own diameter with practically no decrease in cross-sectional area.

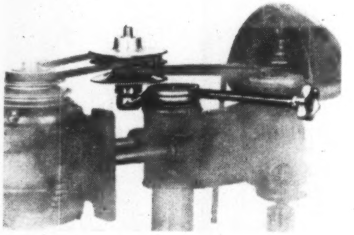
How is Thermaflex sold?
In a wide variety of diameters in standard 12-foot lengths that can be easily spliced or cut for long or short runs.

How can I make sure that Thermaflex will solve my problems?
Write us, outlining your requirements. Our engineers will be glad to put their experience to work for you. Write Dept. 78.

**As approved by the New York Board of Standards and Appeals.*

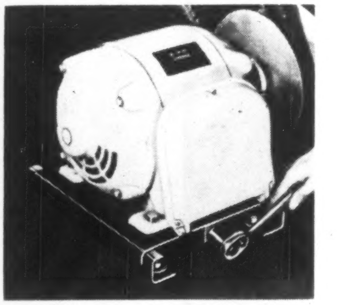
Flexible Tubing
CORPORATION
GUILFORD, CONNECTICUT • LOS ANGELES 64, CALIFORNIA

calibrated dial, single turn adjustment knob and pointer for making pressure settings. Switch adjustments made by independent hex head screws located inside enclosure. Eight models available in adjustable ranges between zero and 180 psi.



Speed Changer . . .
. . . with self compensating, floating pulley arrangement—*Custanite Corp., Dept. HPAC, 1228 Utica Ave., Brooklyn 3.*

Feature is said to permit changing machine speeds without stopping motor. "Ratex" recommended by company for power and feed controls, timing and experimental devices, similar equipment. With variable speed range 6½ to 1 ratio. Fits standard 2¾ in. drill press support posts.



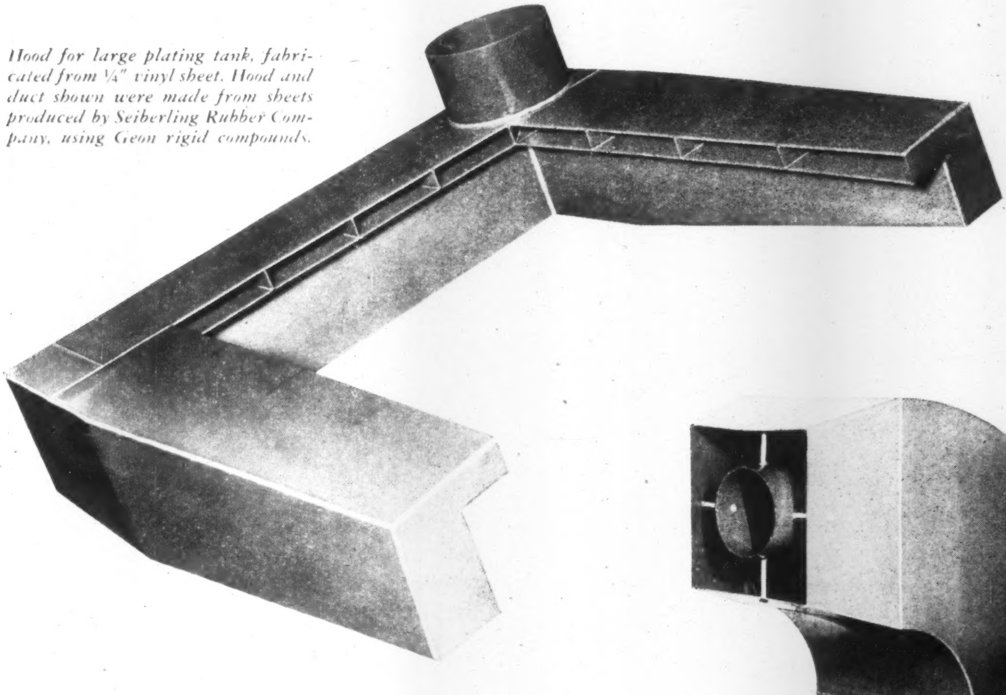
Motor Base . . .
. . . designed to reduce downtime due to stretched, sagging belts — *American Pulley Co., Power-Transmission Div., Dept. HPAC, 4200 Wissahickon Ave., Philadelphia 29.*

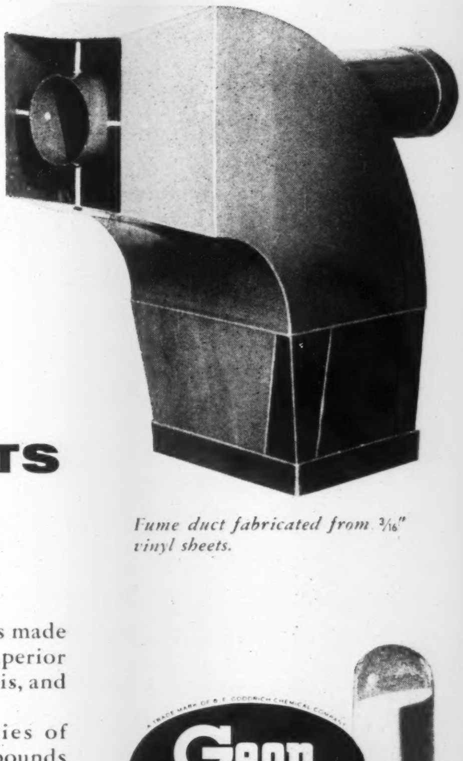
Belt take-up accomplished by adjusting only one screw without stopping motor, says company. "Adjusto-Slide" is also said to facilitate simple

News about

B.F.Goodrich Chemical *raw materials*

Hood for large plating tank, fabricated from ¼" vinyl sheet. Hood and duct shown were made from sheets produced by Seiberling Rubber Company, using Geon rigid compounds.





Fume duct fabricated from 3/16" vinyl sheets.

GEON RIGID VINYL DUCTS

carry away corrosion problems

WITH ducts, hoods, fans and fume stacks now being fabricated from rigid sheets made from Geon polyvinyl compounds, you can eliminate many corrosion replacement problems.

Rigid vinyl sheeting is available from many manufacturers in large sizes, in a range of gages, in normal or high impact grades. It is easy to form, can be worked with standard wood or metal working tools, and can be readily welded. Sheets made of Geon rigid vinyl offer superior resistance to oils, acids, alkalis, and most chemicals.

For booklet on properties of rigid Geon resins and compounds write Dept. FL-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Geon
Polyvinyl Materials

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

THE Fitzgibbons BOILER®

"D" TYPE

Efficient Heat Transfer

Ample firebox volume permits any fuel to be burned efficiently. Unimpeded waterways provide rapid circulation and quick absorption of the heat from the fuel. Proper balance between firebox area and boiler tube surfaces assures full transfer of the available heat for highest operating efficiencies.

Strong Construction

Assembled from quality steel plate in accordance with ASME Code construction requirements by experienced boiler makers. Modern electric welding techniques and manufacturing methods followed by hydrostatic pressure test before shipment assures rugged strength and long life in every Fitzgibbons design.

Easy to Clean and Maintain

Quick access for cleaning and inspection of all heating surfaces is provided through ample gas and soot-tight doors. Large handhole openings permit water-side inspection. The Fitzgibbons "D" Type Boiler is a result of three-quarters of a century of experience in boiler making.

For catalog data on this FITZGIBBONS Steel Boiler, write to the address below.

Fitzgibbons
Boiler Company, Inc.
101 PARK AVENUE, NEW YORK 17, N. Y.
DEPT. 20

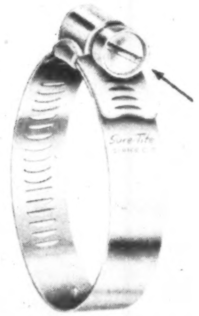
SINCE 1886 · MOST ECONOMICAL IN FUEL · THE FITZGIBBONS BOILER

FB114

EQUIPMENT DEVELOPMENTS

Continued

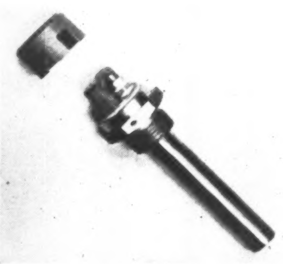
replacement of belts. Can be mounted vertically, horizontally, or in inclined position.



Collared Screw Heads . . .

. . . now available on entire line of "Sure-Tite" stainless steel hose clamps—*Wittek Mfg. Co., Dept. HPAC, 4305-37 West 24th Place, Chicago 23.*

Feature designed to keep screwdriver from slipping. Hose clamps recommended by company for plastic pipe, air hose, industrial applications.



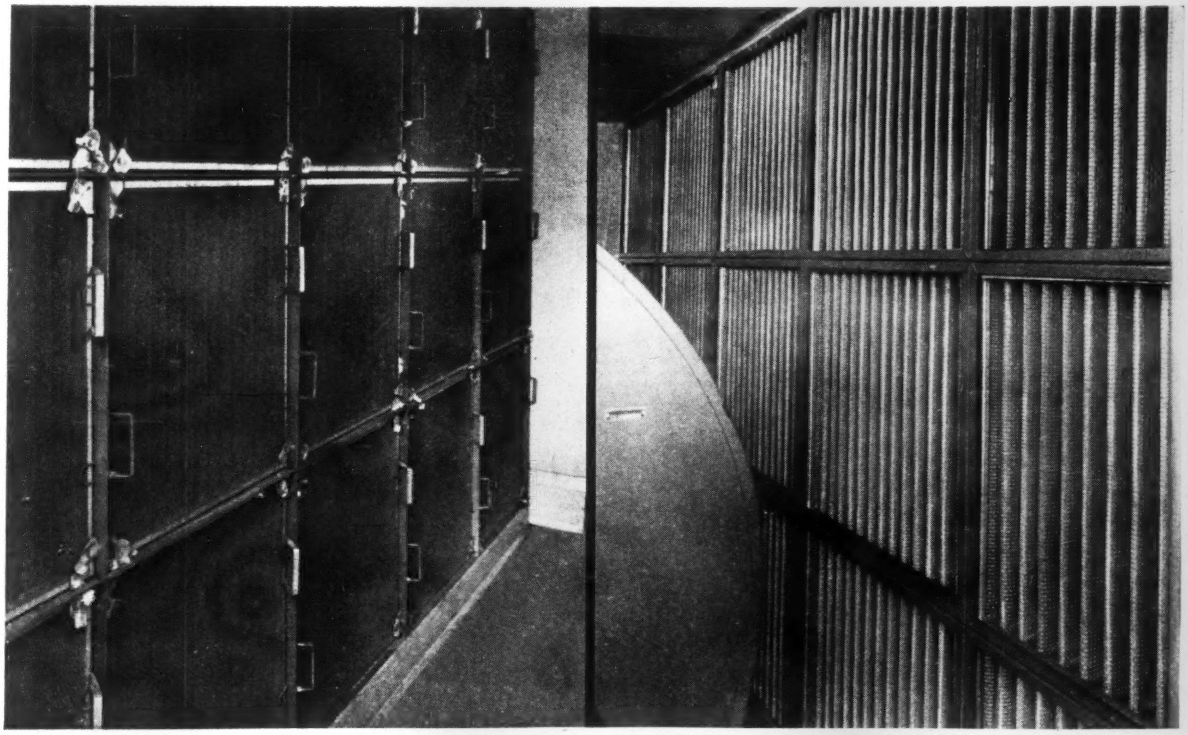
Temperature Controllers .

. . . in several operating ranges from −100 to 1100 F—*Scaico Controls, Inc., Dept. HPAC, P. O. Box 41, Cooper St., Delanco, N. J.*

Furnished in a-c or d-c with differential at setting point of 2 ± percent. Various mounting types are plain cartridge, flanged or threaded.

Electric Hammer . . .

. . . designed to be lightweight, yet powerful—*Modern Mfg. Co., Dept. HPAC, Edgemont and Clementine Sts., Philadelphia.*



Upstream (left) and downstream sides of typical bank of 15 Staynew ventilation filters, Model WKE-8, at Stromberg-Carlson Division of General Dynamics Corporation. Stromberg-Carlson has seven such banks at main plant, has ordered 70 more WKE-8 filters for a second plant.

Installs 179 Model WKE-8 Filters

Stromberg-Carlson Strong on Staynew

When Stromberg-Carlson Division of General Dynamics Corporation expanded rapidly in recent years, increased personnel began to occupy quarters that were once deemed adequately ventilated. The influx of the newcomers, plus a disturbing revelation that roof-mounted filters of the viscous-panel type were letting fly ash seep into offices and painting rooms, prompted a change.

Besides, the frequent maintenance of viscous panels, long a sore point, was being increased.

Stromberg-Carlson's prompt decision to install new ventilation systems in several of the more critical areas has had happy results. Eight new systems containing a total of 109 Staynew filters, Model WKE-8, each equipped with 6-ply Feltex medium, have not only given satisfactory performance since installation a year ago, but their maintenance time has been almost nothing.

The former type, viscous-panel filters, had to be serviced, on the average, every other month. After a full year the Staynew WKE-8s had been serviced only once, though twice-a-year servicing is generally normal. Moreover, a viscous-panel filter takes three times as long to service as a Staynew WKE-8, which may be taken care of on the spot.

On the basis of this economy of operation, Stromberg-Carlson recently purchased another 70 WKE-8s for a second plant.

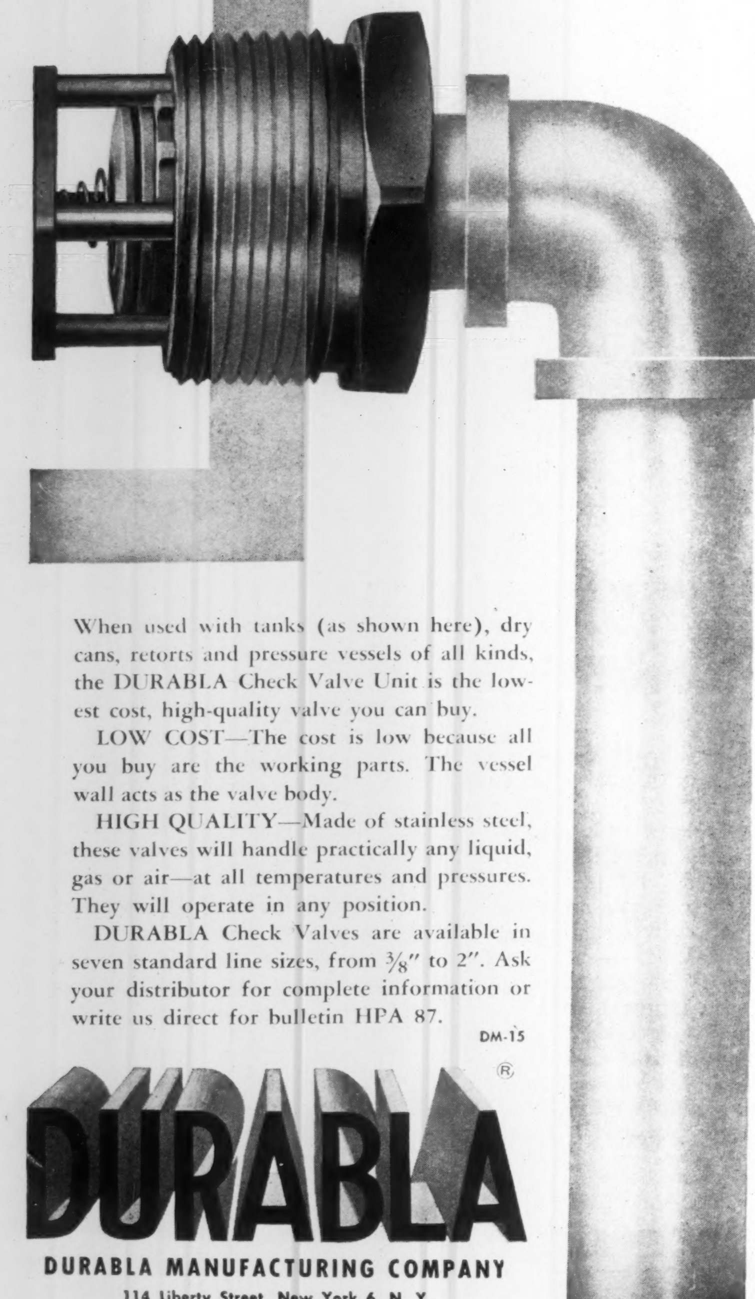
Whatever *your* filter problems, there is a Dollinger representative nearby ready to help solve them. Write for Bulletin 600.
Dollinger Corp., 9 Centre Park
Rochester 3, N. Y.

REG. PROTECTOMOTOR U.S. PAT. OFF.

STAYNEW **DOLLINGER**

FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS



HERE is the ideal CHECK VALVE for tanks and other vessels

When used with tanks (as shown here), dry cans, retorts and pressure vessels of all kinds, the DURABLA Check Valve Unit is the lowest cost, high-quality valve you can buy.

LOW COST—The cost is low because all you buy are the working parts. The vessel wall acts as the valve body.

HIGH QUALITY—Made of stainless steel, these valves will handle practically any liquid, gas or air—at all temperatures and pressures. They will operate in any position.

DURABLA Check Valves are available in seven standard line sizes, from ⅜" to 2". Ask your distributor for complete information or write us direct for bulletin HPA 87.

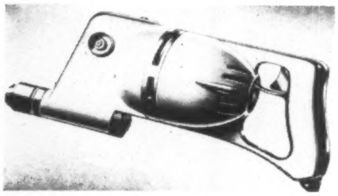
DM-15

DURABLA®

DURABLA MANUFACTURING COMPANY
114 Liberty Street, New York 6, N. Y.

EQUIPMENT DEVELOPMENTS

Continued

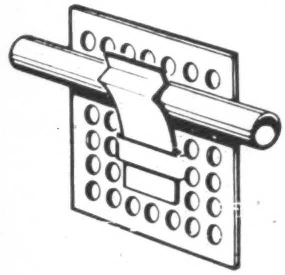


"Slugger" weighs 7½ lb. Recommended by company for drilling, cutting, chiseling. Can drill ⅞ in. hole, 1 in. deep, in concrete in 30 sec, says manufacturer.

Ball Unit Bearing . . .

. . . with new "Tri-Arm" mounting—*Triangle Mfg. Co., Dept. HPAC, Oshkosh, Wis.*

Cited features of "Hiawatha's" mounting: triple cantilever-beam action which unites, pyramids separate strengths of housing and bracket; multiribbed cushion engineered to perform several services simultaneously.



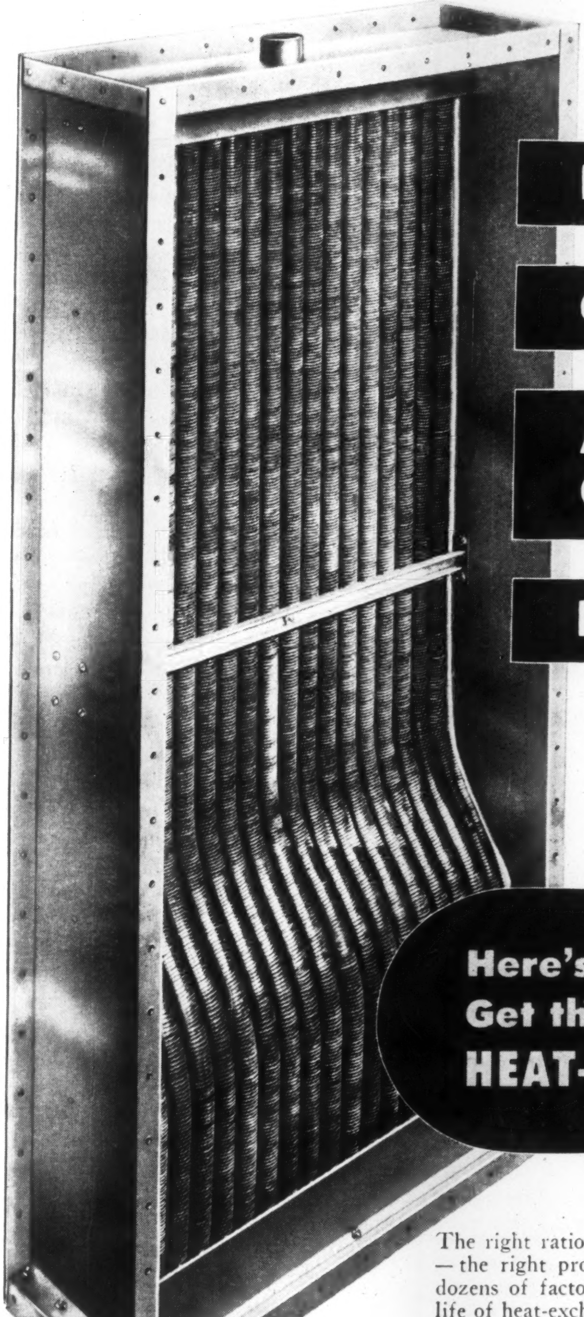
Tubing Spring Clips . . .

. . . for industrial, air conditioning applications—*Stic-Klip Mfg. Co., Dept. HPAC, 500 Regent St., Cambridge 40, Mass.*

Designed to hold conduit, wiring, cable, hose, flexible metal tubing to ducts, ductwork and building surfaces. Now available in larger ⅜ in. size. Maximum holding strength is 75 lb per clip.

Moisture Warning System

. . . designed to detect moisture build-up in air lines of pneumatically operated instruments—*American Instrument Co., Dept. HPAC, 8030 Georgia Ave., Silver Spring, Md.*



Heating?

Cooling?

Air Conditioning?

Process?

Here's How to Get the RIGHT Answer to your HEAT-EXCHANGE PROBLEMS

The right ratio of surfaces – the right materials – the right velocities – the right proportion between coil area and depth . . . there are dozens of factors that affect the efficiency, maintenance and service life of heat-exchange coils.

For best performance in your own application, the practical approach is to take full advantage of the unequalled engineering, research and design skill – the unequalled manufacturing and testing facilities – which Aerofin offers you.

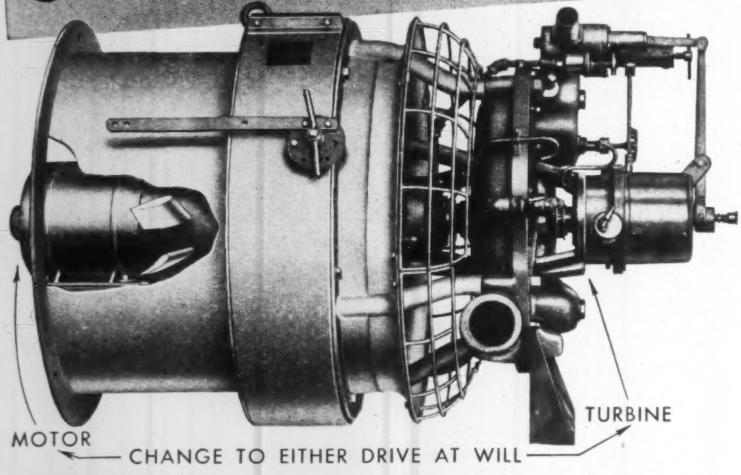
To get the *right* answer – ask the Aerofin man.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

AEROFIN CORPORATION

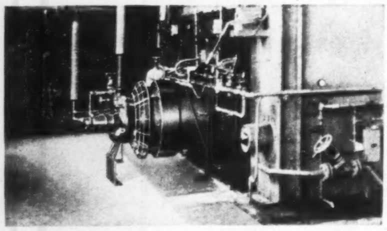
101 Greenway Ave., Syracuse 3, N. Y.

THE MOST FLEXIBLE SOURCE OF FORCED DRAFT



Wing DUAL DRIVE FORCED DRAFT BLOWERS

Practically two blowers in one. When Turbine Drive is used, its oil-free exhaust can supply process or space heating steam. During electrical emergencies turbine drive insures continued operation. Motor drive may be used for starting-up and when process or heating steam demand is low. Precise draft control, manually or automatically. Completely assembled, ready to install.



Wing Dual Drive Forced Draft Blower at Easton, Pa. plant of the Dixie Cup Co.

Use the coupon for more information.

L. J. Wing Mfg. Co. 140 Vreeland Mills Rd., Linden, N.J.
Factories: Linden, N.J. and Montreal, Can.

· Wing ·
DUAL DRIVE
BLOWERS

WING DRAFT INDUCERS

WING TURBINES

WING REVOLVING HEATERS

WING FRESH AIR SUPPLY HEATERS

L. J. Wing Mfg. Co., HP-8
140 Vreeland Mills Rd. Linden, N.J.
Please send engineering data about Dual Drive Blowers.
Name
Firm
Address
City Zone State

EQUIPMENT DEVELOPMENTS

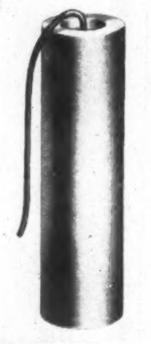
Continued

Monitor system detects build-up when it approaches danger limit, then actuates alarm. Consists of humidity controller and plug-in type electric hygrometer sensing element. May be set for alarm at dew points as low as −45 F at 50 psi, −60 F at 150 psi, says company.

Hot Water System . . .

. . . designed to provide hot water as needed during rush hours without incurring excessive fuel costs at other times—*Laars Engineers, Dept. HPAC, 13246 Saticoy St., North Hollywood, Calif.*

For restaurants, apartment houses, motels, schools, industrial plants, laundries, similar applications. Cited feature is new type storage tank which can deliver more than 85 percent of its contents without drop in outlet temperature, says company.



Smoke Candle . . .

. . . for finding leaks, tracing circulation in air ducts, observing ventilation patterns—*Schiller Mfg. Co., Dept. HPAC, 409 E. Jefferson, Detroit 26.*

Available with yellow or white smoke in 1, 2, 3 min. sizes.

Bolt Anchor . . .

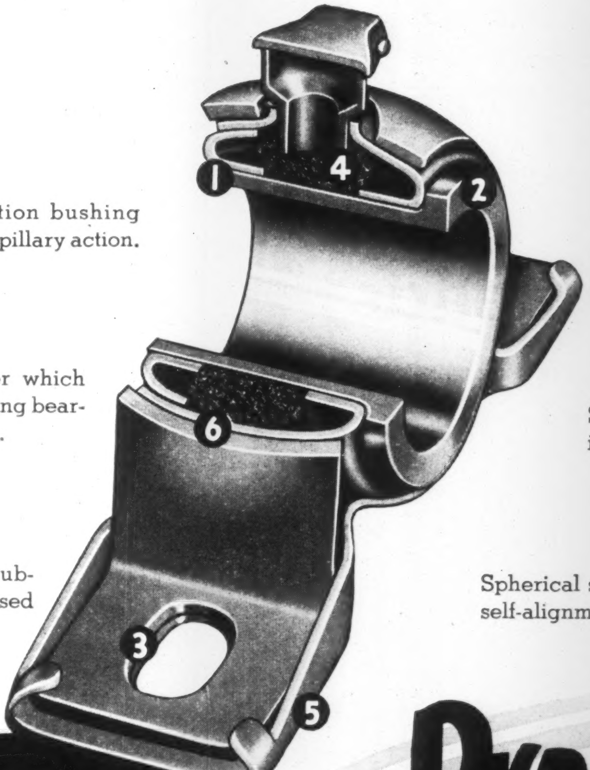
. . . for anchoring heavy equipment to masonry—*Rawlplug Co., Dept. HPAC, New Rochelle, N.Y.*

"Multi-Calk's" caulking sleeve cast of "Rawloy," company's special type alloy for masonry anchors. ✢

① Self-oiling composition bushing feeds oil to shaft by capillary action.

② Bushing has shoulder which provides self-lubricating bearing surface for collar.

③ Slotted Bolt Holes. Rubber grommets can be used for sound isolation.



④ Absorbent filler holds oil in reservoir and prevents over-lubrication.

⑤ Split Pressed Steel Housing is light and strong.

⑥ Spherical surfaces provide full self-alignment.

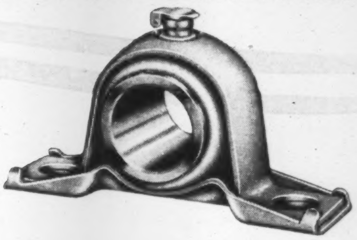
DODGE

Bronzoil

FAN AND BLOWER BEARINGS

Proved

in Millions of installations!

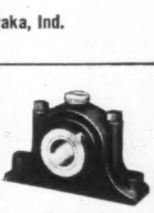


Engineered to meet the specialized requirements of fan and blower service, Dodge Bronzoil bearings are widely and successfully used on small shafts for general service, within the limits of their capacity. Capillary bronze bushing has a capacity of one-third its volume in oil. The liberal oil reservoir, with close fitting wick, surrounding the bushing provides ample lubrication. Millions of Bronzoil bearings have proved their dependability through years of service. Available in shaft sizes from 3/4″ to 1 1/4″. Write now for literature and detailed information.

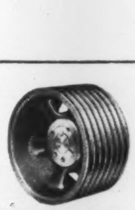
DODGE MANUFACTURING CORPORATION, 1600 Union St., Mishawaka, Ind.

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory-trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone book.



Dodge-Timken Bearings

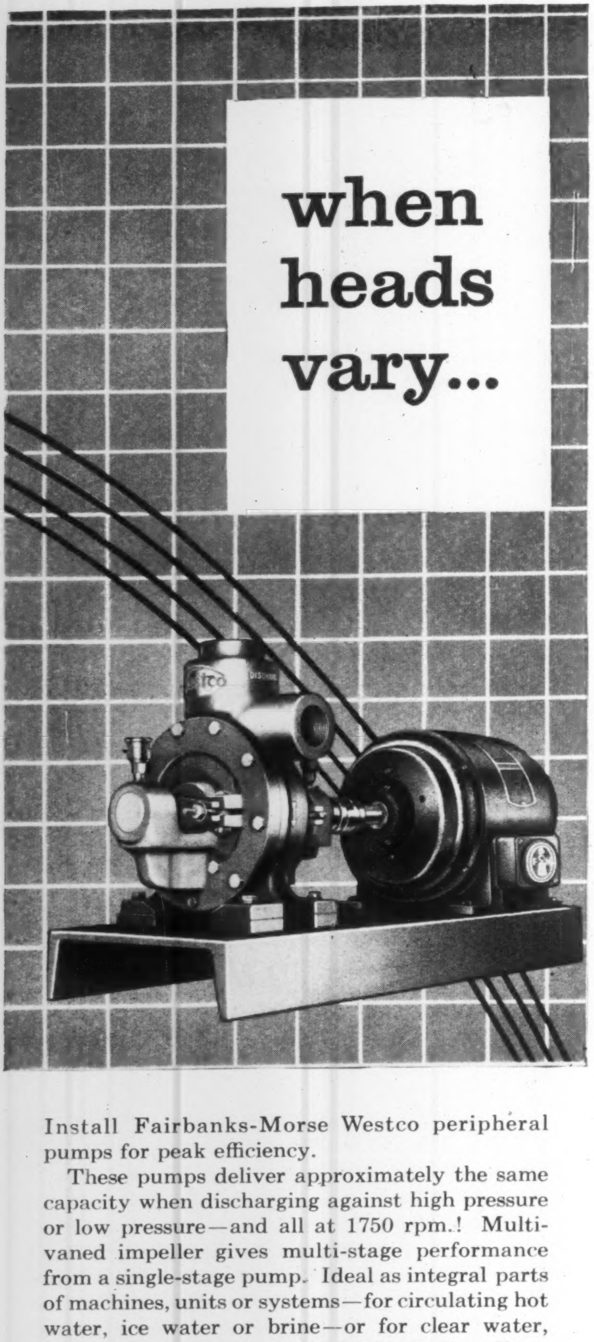


Taper-Lock Sheaves

Sealed-Life V-Belts

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 N. SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS



Install Fairbanks-Morse Westco peripheral pumps for peak efficiency.

These pumps deliver approximately the same capacity when discharging against high pressure or low pressure—and all at 1750 rpm.! Multi-vaned impeller gives multi-stage performance from a single-stage pump. Ideal as integral parts of machines, units or systems—for circulating hot water, ice water or brine—or for clear water, sump, solvents or chemical fluids, feeding filters or boilers, or for booster service. Capacities to 200 gpm., heads to 600 feet.

See your F-M Pump Dealer or write Fairbanks, Morse & Co., Dept. HPA-8, 600 South Michigan Ave., Chicago 5, Illinois.

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a name worth remembering when you want the BEST

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RECENT TRADE LITERATURE . . .

▶ *AIR CONDITIONING*—Literature IMR 57125C covers points installer needs to be aware of in setting console type fan-filter-coil air conditioning equipment, says company. Describes company's "VRC" series of individual room units. Data includes unpacking, roughing-in, locating units, setting in place, piping, outdoor air connections, other information. *Drayer-Hanson, Div. of National-U.S. Radiator Corp., Dept. HPAC, 3301 Medford St., Los Angeles 63.*

▶ *AIR COOLED COOLING UNITS*—Booklets cover units in 2 and 3 ton package models, 3 and 5 ton remote types. Cited features: low operating costs, economical installation, quiet operation. Three folders illustrated with cutaway drawings showing working parts, drawings giving dimensional information. *Wright Mfg. Co., Dept. HPAC, 2902 W. Thomas Rd., Phoenix, Ariz.*

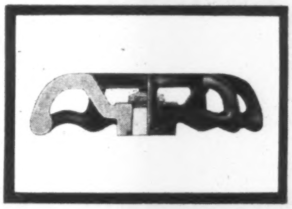
▶ *AIR ELIMINATORS, BALANCING VALVE ADAPTER UNITS*—Wall chart shows company's line of "Auto-Vent" air eliminators and balancing valve adapter units for hot water heating, chilled water cooling systems. Presents application of air vents, together with repair parts for each valve. *Maid-O'-Mist, Inc., Dept. HPAC, 3217 N. Pulaski Rd., Chicago 41.*

▶ *ARMORED MULTIPLE TUBING SYSTEM*—"Multitube" system—in which spirally cabled tubing is enclosed inside flexible, interlocked metallic armor or corrosion resistant polyvinyl chloride thermoplastic sheath, or combination of both—discussed in 12 page brochure. Designed as new method of installing instrumentation, control tubing. Construction is said to provide protection against mechanical, corrosive injury. Literature describes, illustrates

Here's How KENNEDY Construction Means Easier Operation and Longer Valve Life...

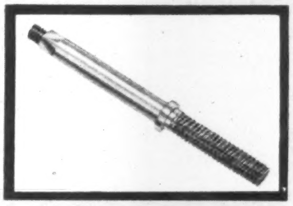
PISTOL GRIP HANDWHEEL

This exclusive design gives a firm, easy 3-way grip on top, sides and bottom. Rim notches under the rim eliminate slipping even when wearing greasy gloves.



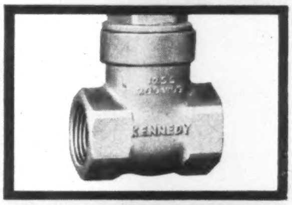
KENALLOY STEM

Kenalloy, the exclusive Kennedy stem material, eliminates the common causes of stem failures. Kenalloy is strongly inhibited against corrosion and dezincification for long, trouble-free service.



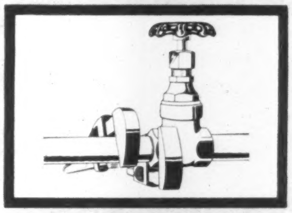
CYLINDRICAL BODY DESIGN

Kennedy's Cylindrical Body Design assures a distortion-free body with a longer trouble-free life. Its greater strength without more weight means less maintenance and better service.



HEX ENDS BLENDED INTO BODY

This new Kennedy feature provides additional strength where it is most needed to prevent distortion during installation and operation. Another Kennedy advantage for better, longer service.



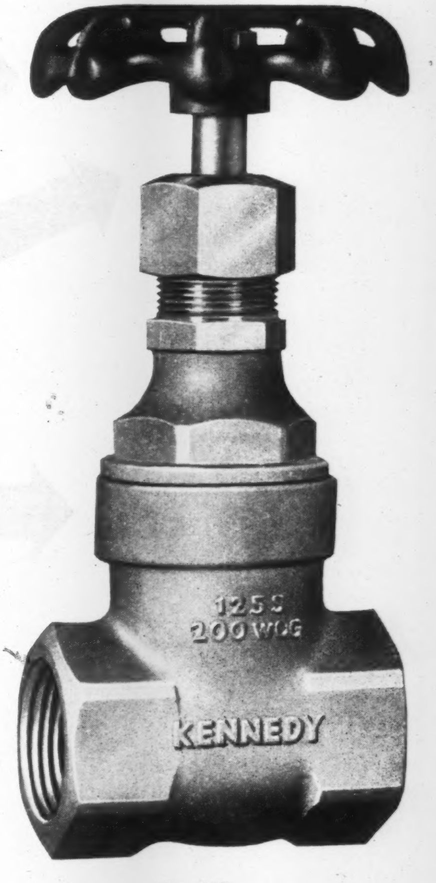


Fig. 427.
125-lb. S.W.P. Bronze Gate Valve.

These additional advantages make KENNEDY your best valve buy...

The solid wedge disc movement is accurately guided by ears machined on the disc. This prevents contact with seating surfaces until the valve is almost closed.

Bonnet Hex is extra large and located close to the face joint where it screws into the body. This makes the valve more rigid and still permits easy removal if it is necessary for clearance in close installations.

The outside diameter of the bonnet has been set back from the outside diameter of the body at the bonnet-body joint. Marring, burring or indenting caused by handling or rugged use will never interfere with a tight body-bonnet joint.

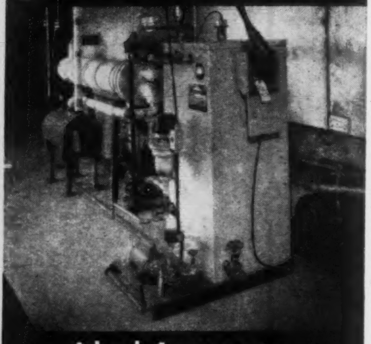
These are only a few of the many Exclusive Kennedy Valve features that make them your best Valve buy for new installations or for lasting replacements. Always specify KENNEDY VALVES!

• *WRITE TODAY FOR COMPLETE DETAILS*

KENNEDY VALVE MFG. CO.
1607 EAST WATER STREET, ELMIRA, NEW YORK
VALVES • PIPE FITTINGS • FIRE HYDRANTS

• OFFICE AND WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO, ATLANTA • SALES REPRESENTATIVES IN PRINCIPAL CITIES •

Pantex SPEEDYLECTRIC STEAM GENERATOR



Ideal Answer to
10 PROBLEMS
in Supplying Steam

- **Without flame, flues or stack**
- **At higher pressures or temperatures**
- **At adjustable pressure or temperature**
- **With a constant high quality**
- **Without long steam lines**
- **To serve summer processing needs**
- **To meet extra load needs**
- **For lab, test, or pilot-plant use**
- **Where an unattended boiler is desired**
- **Where boiler space is limited**

In many such situations, a Speedylectric Steam Generator is the best or only solution. Using the electrode method of generating steam electrically, completely safe anywhere, its design eliminates low-water hazard and practically removes the need for supervision. Generation is fast, by the simplest and most economical electric method, and adjusts automatically to meet load demand. Upkeep is nil . . . there are no coils, tubes or heating elements to scale or burn out. Sizes from 2 to 50 Bhp, 15 to 500 psi. Higher pressures are available. Electric power 220, 440, or 550 volts A. C. UL listed, ASME code.

FOR YOUR FILE

Send for Bulletin SG-100: operating principles, application features, detailed specifications for complete line.

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Send me Bulletin SG-100 . . . free

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Company ....
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RECENT TRADE LITERATURE

Continued

various types; presents data on standard constructions. *Crescent Insulated Wire & Cable Co., Dept. HPAC, Trenton 5, N.J.*

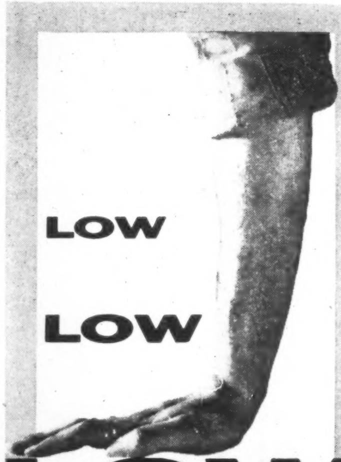
▶ *BOILERS*—The *Hydrotherm Story* tells how gas fired hot water boiler achieves very high Btu output, "immediate" heat response with very low standby losses in minimum space, says company. Booklet includes illustrations of applications, features, advantages. Contains cross-sectional diagrams. *Hydrotherm, Inc., Dept. HPAC, Northvale, N.J.*

▶ *BRAZING ALLOYS*—Specifications for range of "Nicrobraz" high temperature brazing alloys contained in 2 page engineering data sheet No. 16. Eleven alloys listed. Data includes nominal composition, solidus temperature, liquidus temperature, brazed joint ductility, recommended brazing temperatures and atmospheres. *Stainless Processing Div., Wall Colmonoy Corp., Dept. HPAC, 19345 John R. St., Detroit 3.*

▶ *CENTRIFUGAL PUMPS*—New 16 page bulletin, form 7062-C, features "Class GT" general purpose centrifugal pumps in six basic sizes in capacities 100 to 3500 gpm, pressures to 450 psi, heads to 1100 ft, temperatures at 300 F. Literature incorporates cross-sectional drawings, installation views, selection charts, dimension tables. *Ingersoll-Rand Co., Dept. HPAC, 11 Broadway, New York 4.*

▶ *CONDENSATE UNITS, COOLANT SYSTEMS, PUMPS*—1957 catalog, 24 pages, covers company's line of condensate units, coolant systems, general purpose pumps. *S. Gelber & Sons, Inc., Dept. HPAC, 5806 N. Lincoln Ave., Chicago 45.*

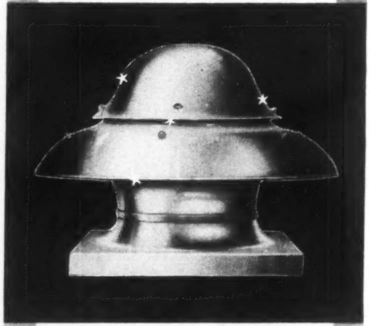
▶ *CONTROLS, VALVES*—Two new bulletins cover the following: No. 100-F — automatic controls, solenoid valves for engine protection, industrial applications; No. 800 —



LOW

SILHOUETTE

TO COMPLEMENT CONTEMPORARY ARCHITECTURAL LINES



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Power Roof Exhausters

- Sleek, low, roof-hugging design provides the most contemporary contour—as well as the most functional and efficient air-moving design.

Precision manufacturing and rugged assembly and whisper quiet operation make the M-Pel-Air the standard of the ventilating industry. Write today for a bulletin on the 'New Look' in roof exhausters.

Manufacturers' agents inquiries invited
BROOKSIDE CORPORATION
McCordsville, Indiana

Where PRECISION PERFORMANCE Counts!...

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DIESEL ENGINEERING

. . . AND ABSOLUTE ACCURACY IS A NECESSITY . . . Look to the Lawler Type "S" Temperature Regulator to fulfill the requirements. Instant response, "hair-line" control with rugged longer-lasting performance make the Type "S" the best temperature regulator available.

Hydraulically formed, non-ferrous bellows type thermostat guarantees instant correcting action in response to the smallest change from desired temperature setting. Highly polished stainless steel stem provides friction-resistant operation . . . rugged durability for a life-time of accurate control. Smaller temperature spread of the Type "S" allows for more accurate control . . . putting the valve into action as soon as the temperature goes off a single degree. No job is too tough . . . no application too unique for the Type "S" Temperature Regulator.

LAWLER TYPE "S" TEMPERATURE REGULATOR

DIRECT ACTING — Accurately controls all steam heating equipment. Protects against over heating . . . a rise in temperature above setting closes valve.

REVERSE ACTING — For cooling systems and recirculating lines. Rising temperature opens valve . . . drop in temperature causes valve to close.

THREE WAY — Mixes hot and cold liquids . . . delivers them at a constant pre-determined temperature.

PERFORMANCE TESTED FOR LONGER LIFE

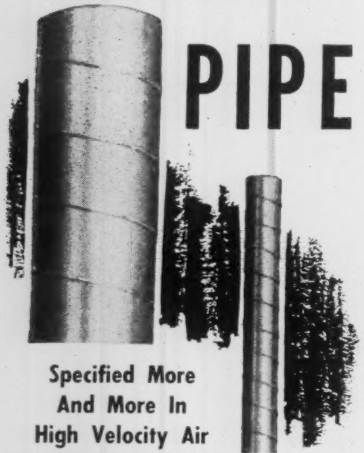
Steam Temperature Regulators
Thermostatic Shower Mixing Valves
Water Controllers
Tempering Valves

DESIGNERS AND PRODUCERS OF THERMOSTATICALLY OPERATED VALVES SINCE 1895

THE Lawler Line of Thermostatic Control Valves

LAWLER AUTOMATIC CONTROLS, INC., MT. VERNON, N. Y.

SPIRAL
Lockseam
PIPE



Specified More And More In High Velocity Air Movement Systems

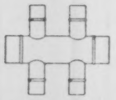
Rigidly constructed Spiral "Lockseam" Pipe by United Sheet Metal Co. is fast replacing longitudinal-seam pipe in high velocity systems. Seams are locked by a strong 4 ply lockseam . . . pipe interiors are smooth. Rigidity derived from this unique construction results in greater strength, faster installation and reduced job-site costs.

Sizes And Standards For High Velocity Air—
- 26 gage zinc-coated steel—diameters 3" through 8"
- 24 gage steel—9" through 22"
- Standard length 12'—lengths to 20' if required
- Available in any specified metal 20 to 30 gage.

PROVEN IN OPERATION

United's Spiral "Lockseam" Pipe has been specified and recently installed in over 400 major building projects . . . including hospitals, mines, government, university and commercial buildings, and churches.

Write For Free Catalogue Showing Detailed Specifications And Applications



MATCHED FITTINGS AVAILABLE FOR EVERY SPIRAL PIPE DIAMETER

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Sheet Metal Co.
543 S. Drexel Ave., Columbus 9, Ohio

RECENT TRADE LITERATURE

Continued

"D.T. Williams" industrial valves for steam, water, air, oil, gas applications. *Detroit Controls Corp., Dept. HPAC, 5900 Trumbull Ave., Detroit.*

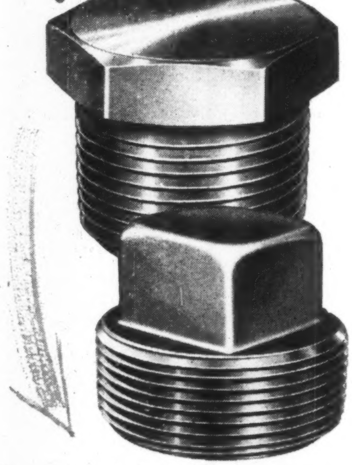
▶ *COOLING TOWERS*—Line of "Flow-Cold" cooling towers in capacities 3 to 20 tons discussed in 4 page bulletin, catalog No. 371. Literature describes units as presenting new concept in tower design—largely result of development of new plastic cooling "pak," says company. Includes data designed to aid selection from six different models. *Acme Industries, Inc., Dept. HPAC, Jackson, Mich.*

▶ *CORROSION INHIBITOR*—Six page folder describes corrosion inhibitor for closed circulating water systems, with or without antifreeze. Lists advantages of "CS," including reported ability to protect steel, copper, brass, aluminum, solder. Schematic drawings illustrate use in hot water heating systems, air conditioning systems. *Hagan Chemicals & Controls, Inc., Dept. HPAC, Hagan Bldg., Pittsburgh* 30.

▶ *CORROSION RESISTANT LINING*—Bulletin PF 17 discusses "C-17 Pre-Krete" low soluble cement base lining formulated for lining interiors of steel water heaters, tanks, vats, other vessels handling bulk liquids. Product is said to form hard, durable lining which prevents oxidation, galvanic corrosion. *Pocono Fabricators, Inc., Dept. HPAC, East Stroudsburg, Pa.*

▶ *DUCTING*—How welded polyethylene duct systems have provided answer to corrosion in handling of alkali, acid fumes is subject of folder. Photographs show installation in operation, details of major components. Charts give data on properties of structural grade polyethylene, specifications of seamless centrifugally cast ducting. *American Agile Corp., Dept. HPAC, P.O. Box 168, Bedford, Ohio.*

Plugs for Pressure



forged steel, high pressure plugs with DRY SEAL tapered threads

CAPITOL square head and hex head solid plugs have dry seal tapered threads to assure safe, permanent high pressure installations. Conveniently packaged for easier handling.

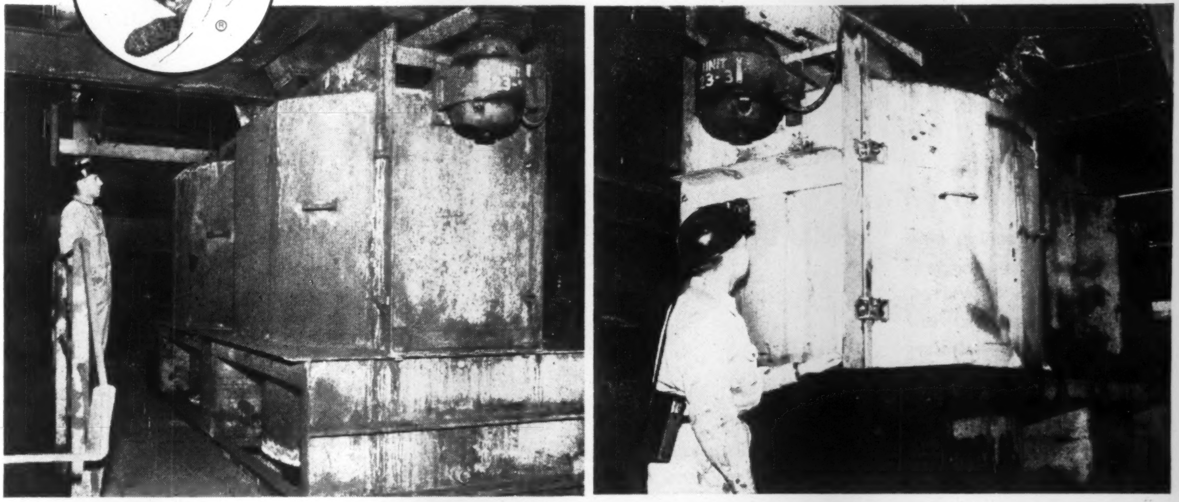
Square Head Solid Plugs sizes 1" thru 2", all forged steel. Hex Head Plugs sizes ½" thru 2" machined from solid bar.

You'll like these thread protectors, too!

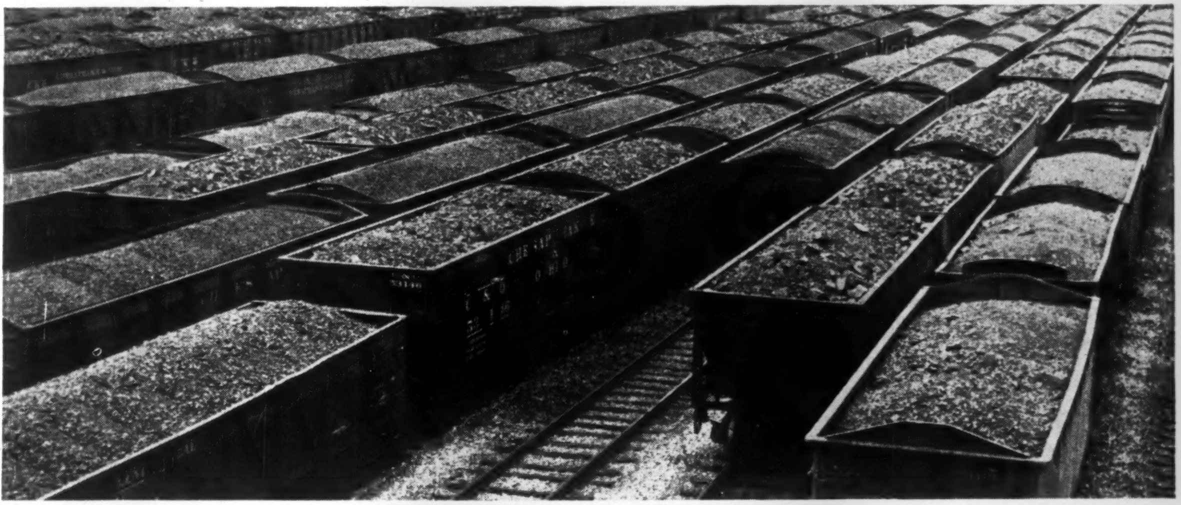
CAP
CAPITOL
MFG. & SUPPLY CO.
COLUMBUS, OHIO

COUPLINGS — NIPPLES — UNIONS — BUSHINGS — PLUGS — REDUCERS — CAPS—CAPADAPTERS—WELL SUPPLIES

WHY CHESSIE'S RAILWAY IS FIRST IN COAL



SUPERIOR COAL. The naturally high quality coals produced on the C&O are processed to meet your specifications by modern methods and equipment. Here small sizes are being dewatered by a battery of vertical screens which do the job with a minimum of degradation.

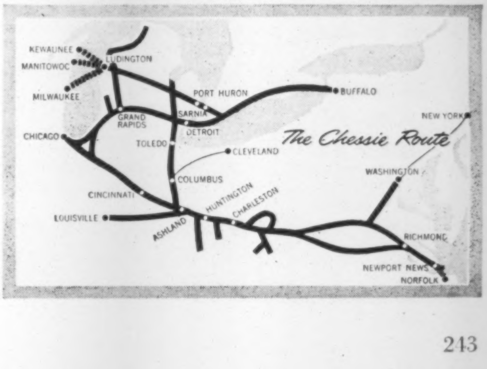


SUPERIOR SERVICE. Chesapeake and Ohio not only owns the world's largest fleet of coal cars—it keeps 99% of them operating by its prompt repair program. New automatic yards, new signal systems and ample power keep the cars rolling to insure on-time delivery.

For dependable deliveries of top quality coals, contact coal producers on the C&O. And for specific help in meeting your own fuel requirements, write to: R. C. Riedinger, General Coal Traffic Manager, Chesapeake and Ohio Railway Co., Terminal Tower, Cleveland 1, Ohio.

Chesapeake and Ohio Railway

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL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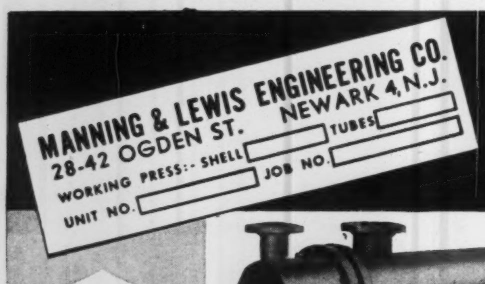
SELF-CLEANING STRAINERS

PIPE LINE STRAINERS
SIZES - TYPES FOR ALL SERVICES

Mueller self-cleaning pipe line strainers are inexpensive protection for valves, meters, pumps, etc. Immediate delivery—all sizes from 1/4" through 16" in stock. Use this low cost form of insurance in all your installations.

Write for bulletin AM giving complete data, prices, specifications, etc.

Mueller
STEAM SPECIALTY COMPANY, INC. 40-20 22nd St., Long Island City, 1, N.Y.


MANNING & LEWIS ENGINEERING CO.
28-42 OGDEN ST. NEWARK 4, N.J.
WORKING PRESS:- SHELL
TUBES
JOB NO.
UNIT NO.

FUEL OIL HEATERS
WATER HEATERS
and COOLERS

THIS NAMEPLATE IS YOUR GUARANTEE OF QUALITY
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Heat Exchangers
Condensate Coolers
Heating Elements
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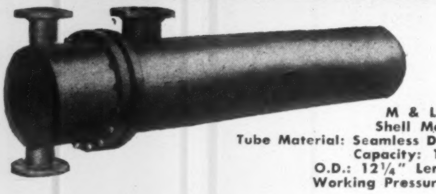

M & L CONVERTER
Shell Material: Steel
Tube Material: Seamless Drawn Copper
Capacity: 13,200 g.p.h.
O.D.: 12¼" Length: 106½"
Working Pressure: 150 P.S.I.

The above unit is one of several M & L Converters now installed at Idlewild Airport in New York. They were designed and fabricated to furnish the heating system of a hangar with water at 140°F.

In order to meet exact specifications, minor changes were made in standard M & L Converters and one more successful installation went into the record.

Our long proven ability to design for a specific need has been extremely helpful in thousands of successful installations all over the country. This service is as near to you as your telephone.

For further details send for your copy of bulletin 780, or we will be happy to send a representative to assist you with any heating or cooling problem.

Manning & Lewis Engineering Company
DESIGNERS & MANUFACTURERS OF QUALITY HEAT EXCHANGE EQUIPMENT
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M.L

RECENT TRADE LITERATURE

Continued

▶ *ENGINE STOP VALVE*—Cushioned automatic engine stop valve described in 8 page bulletin S-3A. Combined throttle and automatic unit designed to shut down turbines, compressors, engines in event of overspeed or runaway. Literature presents typical installation diagrams, various tripping mechanisms, sequence of operation, parts list, dimensions, specifications. *Golden-Anderson Valve Specialty Co., Dept. HPAC, 1210 Ridge Ave., Pittsburgh.*

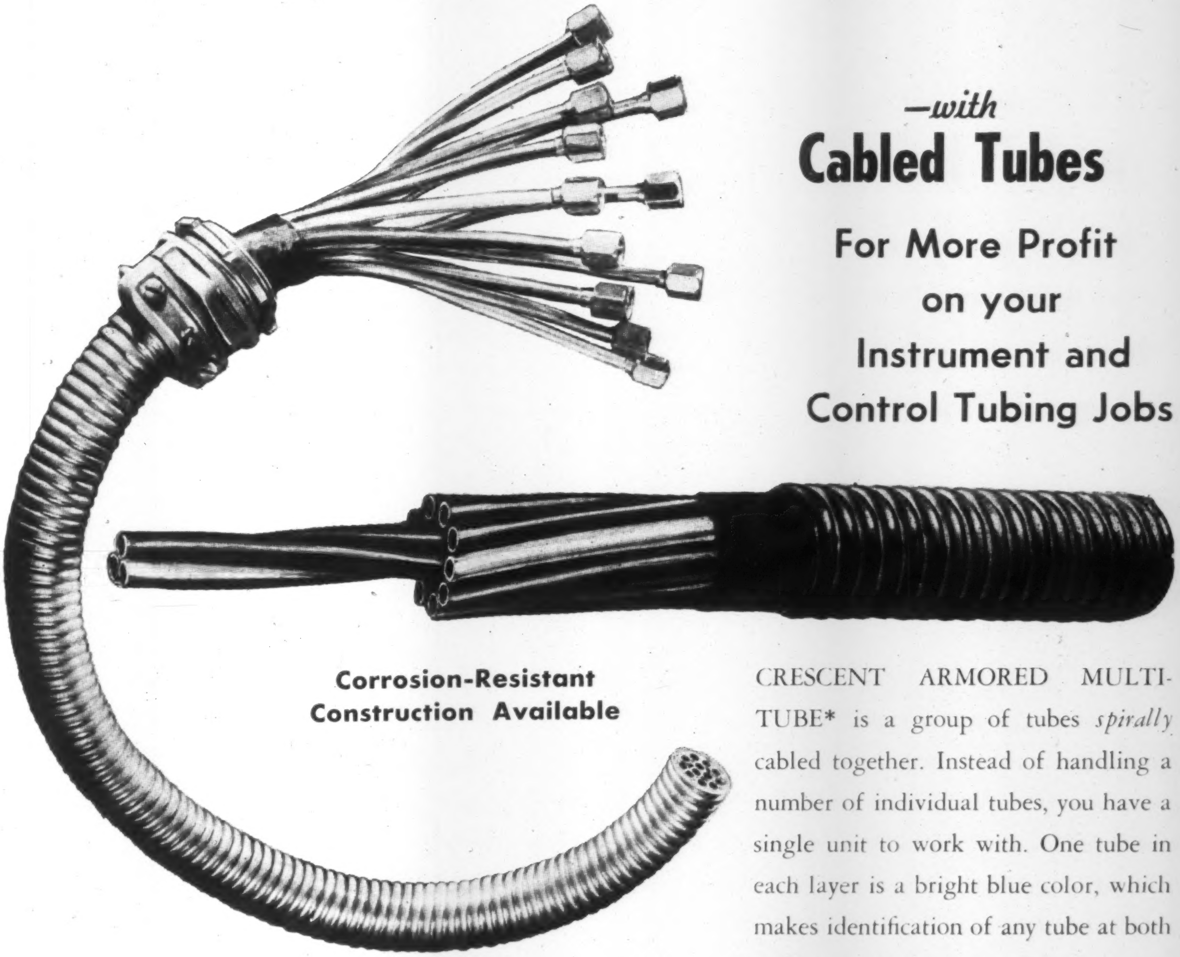
▶ *EXPANSION JOINTS*—"Sylphon" packless expansion joints described, illustrated in 4 page form SF-748. Units designed to cut building costs, save on heat, save on maintenance. Bulletin covers joints for steam or water, for steam only, for water only. Dimensional drawings, table of specifications included. *Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Dept. HPAC, Knoxville 1, Tenn.*

▶ *FANS*—Portable utility fans, mancoolers illustrated, described in 4 page bulletin 250-A. Heavy duty, all purpose units for spot cooling, drying or processing have 2, 4 or 6 blades. Sizes range 16 to 48 in. *Aerovent Fan Co., Inc., Dept. HPAC, Piqua 29, Ohio.*

▶ *FANS*—Adjustable blade vaneaxial "Axivane" fans for commercial, industrial applications covered in new 16 page bulletin J-611. Literature describes design, installation, typical installations, special purpose units. Includes tables of physical data, dimensional drawings. *Joy Mfg. Co., Dept. HPAC, Oliver Bldg., Pittsburgh 22.*

▶ *FILTER FABRIC*—Flyer describes filter fabric made of napped spun orlon. Designated "Feon 408," fabric designed for use with either wet or dry filtration equipment in which very small particle retention with high rate of air or liquid flow is required. *Filtration Fabrics Div.,*

CRESCENT ARMORED MULTITUBE



—with Cabled Tubes

For More Profit on your Instrument and Control Tubing Jobs

Corrosion-Resistant Construction Available

CRESCENT ARMORED MULTITUBE* is a group of tubes *spirally* cabled together. Instead of handling a number of individual tubes, you have a single unit to work with. One tube in each layer is a bright blue color, which makes identification of any tube at both ends an easy matter.

Users report *savings in installed cost* of from two to five times the cost of CRESCENT ARMORED MULTITUBE as compared with the old method of using single tubes. Using the MULTITUBE system will result in fewer connections and fittings, lower cost for supports or racks, ease of mounting and less space.

The spiral cabling of the tubes prevents distortion when the entire assembly is bent on a short radius. The tubing assembly is protected by a flexible, interlocked galvanized steel armor, or by a tough corrosion-resistant thermo-plastic sheath. This product is licensed under U. S. Patent 2,578,280.

*Registered Trade Mark

Furnished in from 2 to 37 Tubes of Copper, Aluminum, Steel, Polyethylene
Also Special Construction for Underground Runs

SEND FOR TECHNICAL BULLETIN NO. 356-I GIVING COMPLETE INFORMATION

CRESCENT INSULATED WIRE & CABLE CO.

Trenton 5, New Jersey

RECENT TRADE LITERATURE

Continued

Filtration Engineers, Inc., Dept. HPAC, 155 Oraton St., Newark 4.

▶ *FLOW METERS*—Bulletin 110 utilizes novel, convenient means for aiding users of flow meters in selection of appropriate meter for specific application, says company. Die-cut disc on inside cover of bulletin serves to indicate pressure, temperature limitations of rotameters as well as their flow capacity ranges. *Brooks Rotameter Co., Dept. HPAC, Lansdale, Pa.*

▶ *GAGES, BAROMETERS*—Four page bulletin No. D-2 covers line of mercurial barometers and vacuum gages, vacuum pump gages, absolute pressure gages. Units are said to have rugged construction to give long service life under difficult operating conditions. *Precision Thermometer & Instrument Co., Dept. HPAC, 1434 Brandywine St., Philadelphia 30.*

▶ *GASKETS, O-RINGS*—Line of gaskets, backup rings, o-rings — said to be impervious to most destructive acids, alkalis, corrosives, solvents at temperatures —120 to 500 F — described in new brochure. Information includes service and mechanical recommendations, data on operating pressures, standard sizes, dimensional details. *Crane Packing Co., Dept. HPAC, 6400 Oakton St., Morton Grove, Ill.*

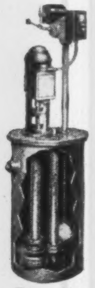
▶ *GATE VALVES*—Folder 1323-Vr designed to aid in selecting right "O-B" bronze gate valve. Valves charted by number, pressure rating, size, type of pipe end, stem design. Bulletin describes basic characteristics to be considered in selection. *Ohio Brass Co., Dept. HPAC, Mansfield, Ohio.*

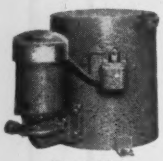
▶ *GEARMOTORS, PACKAGE DRIVES*—New 8-page booklet DB-3650 describes gearmotors and package drives. Horizontal, vertical, right angle, open, enclosed, explosionproof, a-c and d-c units illustrated with their respective reduction ratios, output speeds. *Westinghouse Electric Corp., Dept. HPAC, P.O. Box 2099, Pittsburgh 30.*

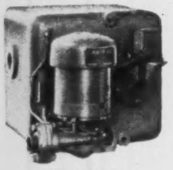
▶ *HEATING, COOLING, AIR CONDITIONING*—Line of "Hydraline" heating, cooling, air conditioning equipment covered in 8 page brochure. Specifications, performance data of remote room air conditioners, packaged water chillers, condensing units, large capacity air conditioners in vertical and suspended models, evaporative condensers, coolers shown. *Industrial Div., York Corp., Dept. HPAC, York, Pa.*

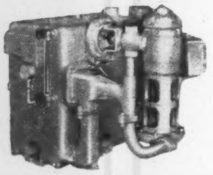
▶ *HOT WATER GENERATORS*—"Thermojet" hot water generators covered in 4 page bulletin 1000. Featuring forced recirculation of water through tubular circuits of boiler, unit built for hot water heating system of either low or high pressure design, says company. Built-in counterflow economizer coupled with high velocity circulation is said to eliminate danger of thermal shock. *In-*

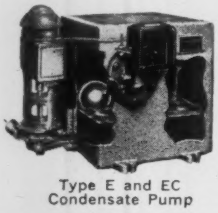
Type S
Condensate Pump

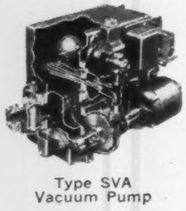

Type U
Condensate Pump


Type MR
Condensate Pump


Type ECR
Condensate Pump


Type VV
Vacuum Pump


Type E and EC
Condensate Pump


Type SVA
Vacuum Pump

Quality Pumps by SARCO

Complete Lines—Condensate and Vacuum

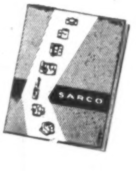
Undivided Responsibility by Sarco
for pumps and heating specialties

These pumps have the efficiency and rugged construction which insure top performance and long, trouble-free service. They are designed and built to Sarco's traditionally high quality standards.

To help you select the right Sarco condensate or vacuum pump for each job, the experienced Sarco-Sarcotherm engineering staff will gladly cooperate.

For Undivided Responsibility . . . specify and order from one "Complete Line" source . . . SARCO-SARCOTHERM . . . pumps, heating specialties, temperature regulators, finned-tube radiation and weather-compensated control systems.

Write for Pump Bulletin No. 1465



SARCO CO., INC. • SARCOTHERM CONTROLS, INC.
Empire State Bldg., New York 1, N.Y.

2226-F

Typical plant ceiling showing foil-faced Pittsburgh Fiber Glass insulation in position.

"Pittsburgh Superfine is easiest to apply... most efficient insulation for steel buildings"

SAYS MR. CHARLES W. JACKSON, *President of Quonco, Inc., fabricated steel building sales and erection firm of Indianapolis, Ind.*

Experience has taught Quonco, Inc., that it takes more than conventional material to properly insulate a fabricated steel building. First of all, the material must be self-supporting and preferably blanket-type. It must be lightweight and very easy to handle. Further, it must be extremely efficient in insulating against heat loss and absorbing noise.

Quonco found all of these insulation advantages in one product—Pittsburgh Superfine Fiber Glass. Mr. Jackson, President of the Indianapolis firm, sums up the advantages this way: "Since Pittsburgh Superfine in our buildings reduces heat loss to only ⅓ that of conventional masonry buildings, our customers can plan for a lower initial investment in heating equipment and cut their estimated fuel costs considerably." As an example, Mr. Jackson cites the case of the world's largest fabricated steel building—7½ acres—in which 300,000 sq. ft. of Pittsburgh Superfine was used. Only one of the plant's three boilers, and 7 of the plant's 12 air supply units is needed to maintain a comfortable 75° for over 3000 employees. Even during hot summer months, temperatures are 10° to 15° cooler inside without air conditioning.

If plant and office modernization or construction is part of your current plans, be sure to know about the unusual features and savings that Pittsburgh Superfine insulation can provide you. For your copy of Bulletins F-100 and F-140, write Fiber Glass Division, Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pa. For immediate service on your specific problem, you can call the nearest Fiber Glass Division sales office listed below.

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RECENT TRADE LITERATURE

Continued

ternational Boiler Works Co., Dept. HPAC, East Stroudsburg, Pa.

▶ *LIQUID METER*—Stainless steel industrial liquid meter—designed to extend company's "nutating-disc" metering principle to measurement of corrosive liquids—described in 4 page bulletin 94/10. Presented are cutaway illustrations, meter and register specifications. *Neptune Meter Co., Dept. HPAC,* 19 *W.* 50*th St., New York* 20.

▶ *MOTOR CONTROL CENTERS*—New 32 page booklet EL-174 details "Unitrol" standardized motor control centers. Illustrated with photographs, charts, layout plans. Presents varied applications, engineering data for selection, planning. *Cutler-Hammer, Inc., Dept. HPAC,* 315 *N.* 12*th St., Milwaukee* 1.

▶ *PIPE INSULATION*—Net prices for pipe insulation can be read directly from tables in 28 page *Manual of Plus Values.* No computation needed, says company. *Union Asbestos & Rubber Co., Dept. HPAC,* 1111 *W. Perry St., Bloomington, Ill.*

▶ *PIPING*—*Pressure Ratings for 90° Unreinforced Branch Connections of Seamless Steel Pipe* is title of 8 page technical bulletin TB2-1956. In two parts, first part presents pressure reduction ratio for 90 deg branch connections in standard weight and extra strong pipe, while second part presents pressure ratings for 90 deg branch connections in standard weight and extra strong seamless carbon steel pipe to ASTM A53 grade B and ASTM A106 grade B. *Pipe Fabrication Institute, Dept. HPAC,* 1 *Gateway Center, Pittsburgh* 22.

▶ *PRESSURE REGULATORS*—New 4 page brochure, No. 1011 describes line of pressure regulators. Selection data with photographs presented on three principal types of main valves, pilots. Suggested applications for regulators illustrated. Steam capacity table for selection of main valve size shown. *Spence Engineering Co., Inc., Dept. HPAC, Walden, N.Y.*

▶ *PUMPS*—Single stage, double suction pumps—with speeds 1150 to 3500 rpm, capacities 50 to 200 gpm, heads 25 to 300 ft—covered in 4 page bulletin 115. Literature includes illustrations, dimensional drawings, specifications, tables. *M.T. Davidson Co., Dept. HPAC,* 7 *Dey St., New York* 7.

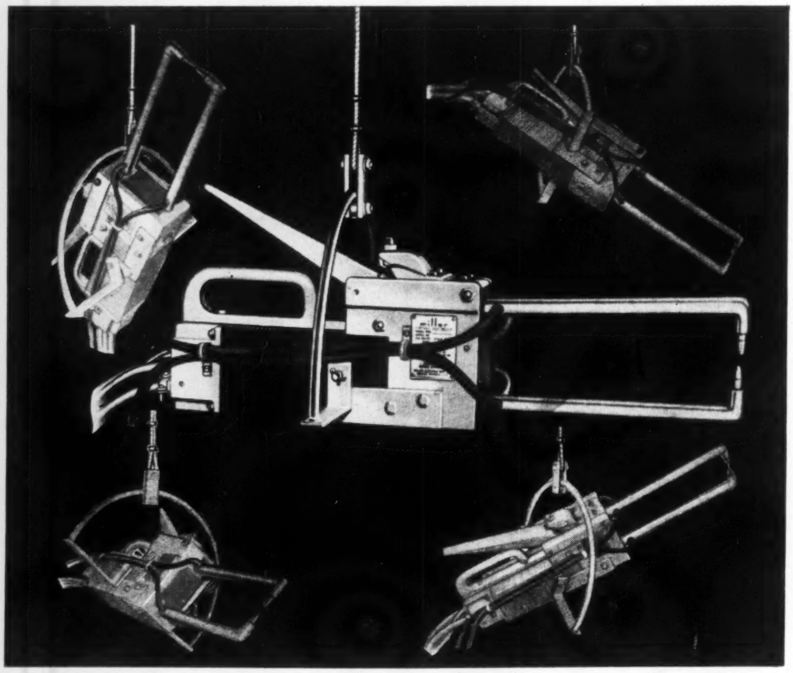
▶ *PUMPS*—Motor driven controlled volume pumps detailed in 32 page bulletin No. 553-1. Literature contains specifications, latest design features of positive displacement units designed for metering, pumping of corrosive liquids against pressure. Standard, modified models and their applications illustrated, described. *Milton Roy Co., Dept. HPAC,* 1300 *E. Mermaid Ln., Philadelphia* 18.

▶ *REFRIGERATION, AIR CONDITIONING*—New 24 page refrigera-

WORKS ALL THE ANGLES

MPS Portable Water Cooled Spot Welder

Manually or air operated, these welders are equipped with ball bearing suspension rings for fatigue-free operation. Water cooled transformer and tongs. 6″ tongs grip work with pressure up to 600 pounds. Air models actuated by 4-way valve, electrically operated. Made for 50/60 cycle 220 volt use, Model 10-KVA weighs 79 lbs., welds material up to 3/16″; Model 20-KVA weighs 91 lbs., handles 1/4″ combined thickness. Air operated models average 53 lbs. more. Available also in pedestal style.



miller ELECTRIC MANUFACTURING COMPANY, Inc. • Appleton, Wisconsin

Distributed in Canada by: Canadian Liquid Air Co., Ltd., Montreal, P. Q.

tion and air conditioning catalog No. R-657 shows or lists over 600 items in company's line. In addition to charging lines, hermetic port valve and refrigerant dispensing kits, literature covers flare fittings, strainers and dryers, capillary tube, tube working tools, brass pipe fittings. *Madden Brass Products Co., Dept. HPAC, Aurora, Ill.*

▶ *RUST, CORROSION TREATMENT*—Treatment for rust and corrosion in steam lines, return lines, radiators, steam heated processing equipment described in 2 page bulletin M-A. Causes of rust, corrosion and action of water treatment explained. *North American Mogul Products Co., Dept. HPAC, Standard Bldg., Cleveland 13.*

▶ *SOLDERING*—Six page manual provides summary of origin, uses of soldering throughout the world. Describes various types of solder, fluxes, methods of soldering, basic characteristics of certain metals which give them "solderability" and "conductability." *Anchor Metal Co., Inc., Dept. HPAC, 966 Meeker Ave., Brooklyn.*

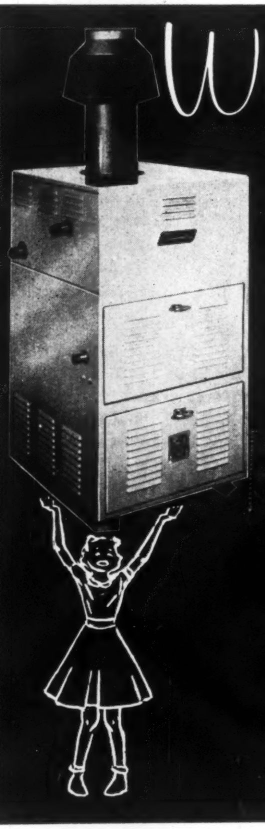
▶ *SONIC GAS ANALYZER*—Gas analyzer employing velocity of sound and said to offer exceptional range, sensitivity, rapidity of analysis described in 3 page bulletin 175. Monitoring of gas mixtures by continuous or batch control, detection of minute amounts of harmful gases, vapor and gas chromatography are cited applications. *National Instrument Laboratories, Inc., Dept. HPAC, 6108 Rhode Island Ave., Riverdale, Md.*

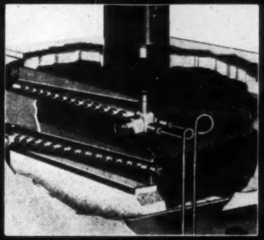
▶ *TEMPERATURE CONVERSION CHART*—Pocket sized Fahrenheit-centigrade temperature conversion chart offered free by company to engineers, students, others. *Moeller Instrument Co., Dept. HPAC, Richmond Hill 18, N.Y.*

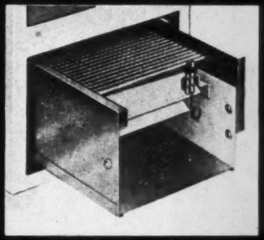
▶ *THERMOSTATIC EXPANSION VALVE*—Two page bulletin covers "Model 214" thermostatic expansion valve for fluorinated hydrocarbon refrigerants Nos. 12 and 22. Dimensions, specifications, recommended applications, charts for different models shown. *A-P Controls Div., Controls Co. of America, Dept. HPAC, 2450 N. 32nd St., Milwaukee.*

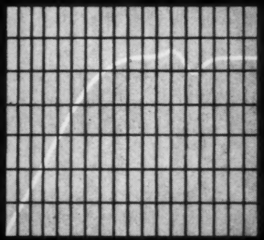
▶ *THERMOSTATIC STEAM TRAPS*—"Quik-Flex" thermostatic steam traps for outdoor and non-freeze service described in bulletin No. 257. Specifications, capacities given in table form, accompanied by dimensional drawings. Piping diagram shows recommended method of installation. *V. D. Anderson Co., Div. of International Basic Economy Corp., Dept. HPAC, 1935 E. 96th St., Cleveland 2.*

▶ *TIMERS, RELAYS*—Among equipment described in new combination catalog-manual are repeat cycle timers, time delay relays, elapsed time indicators, stop clocks, a-c/d-c and chronometrically governed timing motors, relays. Loose-leaf manual









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BECAUSE THEY'RE LIGHT AND COMPACT . . . BUT THAT'S NOT ALL!

Only RAYPAK
Features raised port pressed stainless steel burners of extraordinary performance—inaudible on ignition or extinction on any type of gas—the finest burner available, anywhere — mounted on a sliding drawer.

Only RAYPAK
Features integral finned copper water tube heat exchanger . . . strong and of highest efficiency, complete with tapered bronze headers and clean-out plugs — perfect hydraulics — high temperature resisting — rust proof.

Only RAYPAK
Features gas modulation . . . the most advanced water temperature control system. Available in all Raypak heating and volume supply boilers. Check this typical curve — you can see why it's the finest.

SIZES 80,000 THROUGH 600,000 BTU's.

CALL OR WRITE

Raypak COMPANY, INC.
2416 CHICO AVENUE, EL MONTE, CALIFORNIA

RECENT TRADE LITERATURE
Continued

contains 25 bulletins. Insertion of new bulletins or replacement of revised ones takes only few seconds, says company. *A. W. Haydon Co., Dept. HPAC, 232 N. Elm St., Waterbury, Conn.*

▶ *TURBINE FLOW METERS*—Catalog 10C150 describes turbine flow meters designed for precise measurement of liquid flow. Installed directly into process piping, meters can measure flow rates from less than 1 to over 2500 gpm for variety of liquids, says company. *Fischer & Porter Co., Dept. HPAC, 75 Jacksonville Rd., Hatboro, Pa.*

▶ *UTILITY SETS*—New 52 page catalog, bulletin 8314, details company's line of "Sirocco" utility sets. Illustrates, describes various size ranges, configurations of fan wheels and motors available. Among selection criteria discussed are space volume, quantity of outdoor air required, altitude and temperature correction, outlet velocity, duct size, static pressure, tip speed. *American Blower Div. of American-Standard, Dept. HPAC, Detroit 32.*

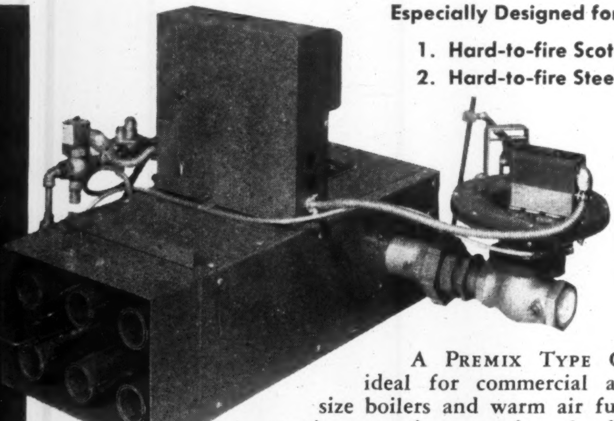
▶ *VALVE*—Catalog sheet describes "No. 1605" spring loaded, dual purpose relief and back pressure valve. Unit designed to function on both condensing, noncondensing systems. Literature contains photograph, cutaway diagram, design features, dimensions, list of materials. *Atlas Valve Co., Dept. HPAC, 280 South St., Newark 5, N.J.*

▶ *VALVES*—New folder describes brass valves with "quick-change" composition disc in globe, angle, lift check types. Units recommended by company for broad range of services, including steam, water, air, oil, gas, gasoline. Literature shows how disc may be replaced without removing valve body from line. *Crane Co., Dept. HPAC, 836 S. Michigan Ave., Chicago 5.*

▶ *VALVES, DRYERS, STRAINERS*—New catalog covers valves, dryers, strainers and accessories for refrigeration, air conditioning and industrial applications. Included is new series of "Golden Bantam" packless valves, "Abso-Dry" pressure sealed dryers, liquid indicators, cast bronze strainers. *Henry Valve Co., Dept. HPAC, 3215 North Ave., Melrose Park, Ill.*

▶ *VAPOR EQUALIZING VALVES, AIR ELIMINATORS*—Installation data sheet covers vapor equalizing valves and air eliminators for steam heating systems. Diagrams illustrate methods of installing air eliminators on steam mains. *Gorton Heating Corp., Dept. HPAC, Cranford, N.J.*

▶ *VELOCITY METER*—"Velometer," designed for instant and direct reading of both suction and supply air velocities, detailed in 8 page bulletin 2448. For heating, air conditioning. *Illinois Testing Laboratories, Inc., Dept. HPAC, 420 N. La Salle St., Chicago 10.* ‡



Especially Engineered to Permit . . .

HIGH FIRING RATES at HIGH EFFICIENCY

MULTURI (MULTIPLE VENTURI) BURNERS

- Formed steel mixers, finished for corrosion resistance, offer minimum resistance to mixture flow, result in uniform high capacity.
- High temperature resisting stainless steel flame retainers insure flame stability over a wide capacity range.
- Mixer design produces a hot clear flame, results in high combustion efficiency with minimum excess air.

Especially Designed for . . .

1. Hard-to-fire Scotch Marine Boilers
2. Hard-to-fire Steel Fire Box Boilers

Multuri Burners available in standard units, 4 to 54 mixers. Capacities 700,000 to 10,800,000 BTU/hr. Higher capacities can be furnished.

A PREMIX TYPE GAS BURNER, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Controlled flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4" gas pressure or more. Permits high firing rates at high efficiency. Simple to install, adjust, and operate. Completely Factory Wired and Assembled — Ready for Immediate Installation !

Write for detailed information—or for a questionaire listing all the data necessary for correct specifications and efficient installation.

GAS HEATING EQUIPMENT

ROBERTS-GORDON

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FURNACES • COOLING UNITS • BOILERS • UNIT HEATERS • GAS BURNERS

WHO'S WHAT . . .

(New personnel, promotions)

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▶ *McQUAY, INC.*—Byron E. James, president; Jay R. Resch and Kenneth R. Lundberg, vice presidents; G. G. Workinger, general sales manager.

▶ *FUEL OIL AND WATER HEATER MANUFACTURERS' ASSOCIATION*—J. De Lorenzo, Manning & Lewis Engineering Co., treasurer. Elected directors are: F. Gall, Bell & Gossett Co.; W. Veit, Manning & Lewis; B. Madorin, Water Tube Boiler & Tank Co.

▶ *YARNALL-WARING CO.*—Newly elected officers are: Bernard G. Waring, honorary chairman of the board; D. Robert Yarnall, chairman of the board; Frank W. Miller, president; Joseph Kildare, senior vice president for sales; D. Robert Yarnall, Jr., vice president for manufacturing; John A. Steer, vice president, general products sales; R. S. Pollard, vice president, distributor products sales; Mary S. Trimble, treasurer and secretary; George I. Tyndall, assistant treasurer and assistant secretary.

▶ *FAIRBANKS, MORSE & CO.*—Robert H. Morse, Jr., president and chief executive officer; Gordon R. Anderson, vice president, engineering; F. M. Mason, Jr., vice president, government business; Robert Dana Brown, secretary and assistant treasurer; R. E. Whiteley, assistant secretary.

▶ *BOILER AND AIR CONDITIONING MANUFACTURERS ASSOCIATION*—Fred R. Attwood (Spi-Rol-Fin Corp.), president; Gustav H. Koven (Waterfilm Boilers, Inc. and L. O. Koven Co.), vice president; M. C. Turpin, executive secretary.

▶ *ROBERTSHAW-FULTON CONTROLS CO.*—Thomas T. Arden, president; John A. Robertshaw, chairman of the board; Charles E. Smith, assistant national service director.

▶ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—H. T. Sparrow, director of product research for temperature control phase of company's business; Stanley J. Nelson, director of temperature control engineering; J. R. Gentry, factory manager of all

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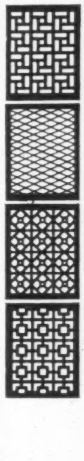

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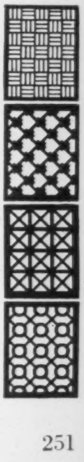

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WHO'S WHAT

Continued

Minneapolis plants; Donald L. Murphy, general superintendent of Minneapolis plants.

▶ *FLUID CONTROLS INSTITUTE, INC.*—Officers for the coming year are: John S. Leslie, Leslie Co., president; Dean E. Madden, A. W. Cash Valve Mfg. Corp., vice president; Marshall B. Taft, Minneapolis-Honeywell Regulator Co., vice president; Paul K. Rogers, Jr., Skinner Chuck Co., treasurer; Edward J. Glinske, Jr., Cochrane Corp., secretary.

▶ *KENNEDY VALVE MFG. CO.*—James W. Dashner, chief engineer.

▶ *WEBSTER ELECTRIC CO.*—Preston G. Crewe, recipient of an "Aladdin Lamp," highest award for service to the Oil-Heat Institute of America. Mr. Crewe is vice chairman of the board for Webster Electric.

▶ *DUNHAM-BUSH, INC.*—Kenneth Gair, vice president and assistant general manager of Brunner Co., Gainesville, Ga., a wholly owned subsidiary; Thomas W. Cashman, purchasing agent for Brunner Div., Utica, N.Y.

▶ *AIR MOVING AND CONDITIONING ASSOCATION*—W. Rutter, chairman of power roof ventilating division. Mr. Rutter is chief engineer, Burt Mfg. Co.

▶ *NEPTUNE METER CO.*—William H. Cochrane, a director and executive vice president.

▶ *ROBERTS-GORDON APPLIANCE CORP.*—Robert I. Warnecke, executive vice president.

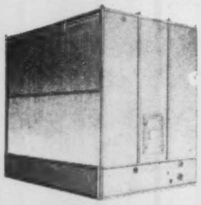
▶ *REPUBLIC FLOW METERS CO.*—Russell L. Sylvester, engineering executive assistant. He was chief engineer of Rockwell Mfg. Co.'s central valve research and development department. Republic is a newly acquired Rockwell subsidiary. Mr. Sylvester will be primarily responsible for coordinating engineering and sales activities of the two companies.

▶ *McGILL MFG. CO., INC.*—Edward P. Grass and Ray A. Bouvier, general manager and chief engineer, respectively, for electrical division.

▶ *AMERICAN WELDING SOCIETY*—Fred L. Plummer, national secretary.

▶ *TRANE CO.*—Robert P. Marshall, factory superintendent of new plant to be erected in Clarksville, Tenn. Promotions at Scranton plant are: Gregory B. Littell, Jr., superintendent; Alexander S. Hair, general foreman.

▶ *ROCKWELL MFG. CO.*—Charles N. Perry, factory manager of new Porterville, Calif., plant.



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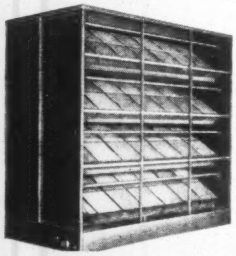

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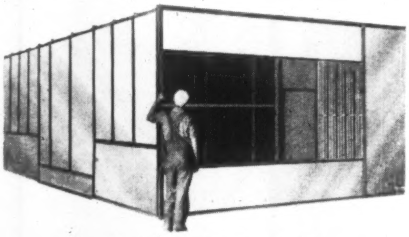

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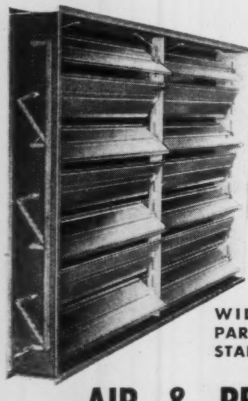

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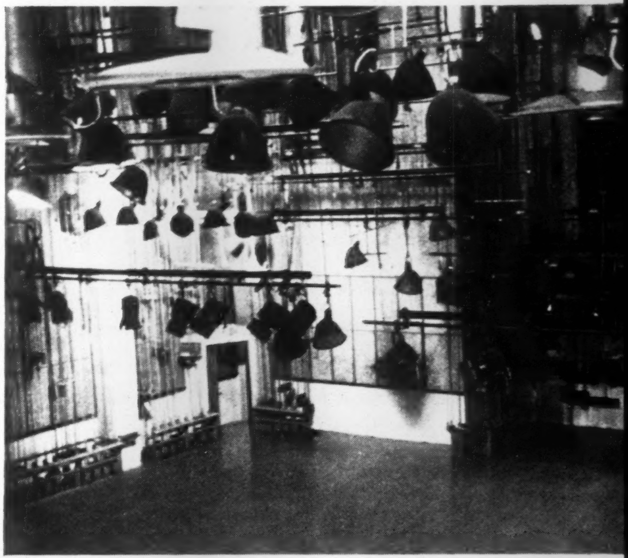

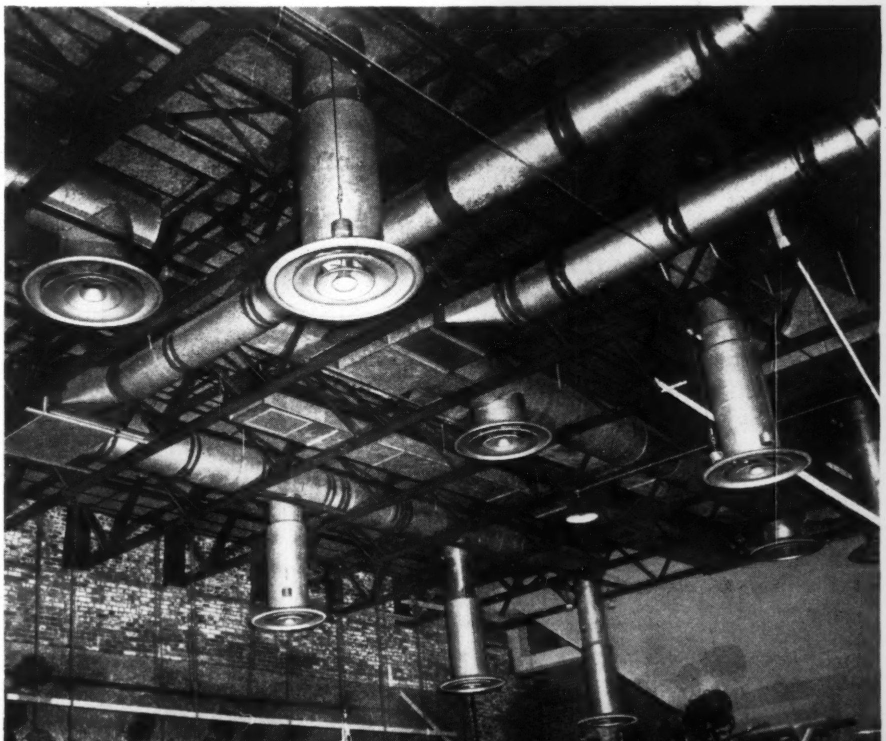

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▶ *NORMAN PRODUCTS CO.*—Henry R. Patsky, director of sales.

▶ *RAMSET FASTENING SYSTEM, OLIN MATHIESON CHEMICAL CORP.*—James J. Clarke, sales manager.

▶ *A. M. BYERS CO.*—Harry R. Rowland and Richard I. Enzian, vice president and manager, respectively, of wrought iron sales; William M. Domville, assigned to advertising department.

▶ *DE LAVAL STEAM TURBINE CO.*—W. J. Mongon, manager of marine standard products department; J. E. Gutzwiler, assistant chief engineer of standard products department; Michael Toth, manager of turbocharger sales.

▶ *DUNKIRK RADIATOR CORP.*—M. C. Reed, president.

▶ *WALTER KIDDE CONSTRUCTORS, INC.*—E. G. Robbins and Frank L. Whitney, directors.

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Continued

▶ *BATTELLE MEMORIAL INSTITUTE*—Edward E. Slowter, vice president.

▶ *YORK CORP.*—Richard C. Niess, manager of refrigeration sales, Industrial Div.

▶ *MINE SAFETY APPLIANCES CO.*—H. B. Stafford and N. W. Hartz, operations manager and sales manager, respectively, of recently established technical products division.

▶ *DeVILBISS CO.*—John M. Robinson, executive vice president; John M. Ehni, vice president, foreign sales; Edward J. Etzel, vice president, purchasing.

▶ *TRANTER MFG., INC.*—Clarence C. Smith, director of engineering.

▶ *FLEXONICS CORP.*—Robert W. Phillips, chief engineer of synthetics and plastics in research and development division. He has also been elected to the Flexonics executive council.

▶ *NATIONAL-U.S. RADIATOR CORP.*—Robert A. Allwein and Franklin Y. Reiter, superintendent and manager, respectively, of company's Duncansville, Pa., plant; Robert A. Hoy, director of purchases, succeeding Mr. Reiter.

▶ *BURGESS-MANNING CO.*—S. G. Paddock, executive vice president; F. P. Hutchinson, a director; E. D. Woisard, treasurer and assistant secretary; A. W. Dreffein, secretary.

▶ *WESTINGHOUSE ELECTRIC CORP.*—James H. Jewell, vice president in charge of marketing.

▶ *CRANE CO.*—Joseph W. Greene, vice president of sales; Charles W. Lovelace, director of industrial sales, succeeding Mr. Greene.

▶ *ALUMINUM CO. OF AMERICA*—A. R. Van Vorst, manager of impact extrusion sales; C. Christy Jones, assistant manager of sales for extruded shapes and tubing; Robert W. Dispennett, manager of sales for closures and collapsible tubes; H. Roger Richter, assistant to manager of extrusion and tubing sales with headquarters at Alcoa's Vernon, Calif., works.

▶ *REFLECTAL CORP.*—Edmund M. Burke, "Koolshade" product manager.

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Continued

▶ *LOCKWOOD GREENE ENGINEERS, INC.*—Edward B. Moebus and Samuel B. Roberts, vice presidents at the engineering and architectural firm's New York office.

▶ *BAILEY METER CO.*—C. E. Sutherland, vice president in charge of manufacturing; E. O. Stern, treasurer and assistant secretary; H. H. Gorrie, a director.

▶ *FOSTER-MILLER ASSOCIATES, INC.*—Stanley Berns, a director of the Watertown, Mass., consulting mechanical engineering firm.

▶ *TRANE CO.*—Richard Schiewetz, general manager of new plant at Clarksville, Tenn.

▶ *WHEELABRATOR CORP.*—Verne E. Minich, honorary chairman of the board; Otto A. Pfaff, chairman.

▶ *SERVEL, INC.*—Louis Ruthenberg, recipient of a "Gold Knight of Management" trophy presented by the Southwestern Ohio Council of the National Management Association. Mr. Ruthenburg is chairman of the board of Servel.

▶ *COMBUSTION ENGINEERING, INC.*—Samuel R. Parry, vice president.

▶ *WHIRLPOOL CORP.*—G. James Alaback, director of engineering for St. Joseph Div.

▶ *QUAKER RUBBER DIV., H. K. PORTER CO.*—James H. Joyner, general manager, Pioneer Works; B. V. Edmunds, works manager.

▶ *MARSH VALVE CO.*—Peter P. Balnis, president.

▶ *MILTON ROY CO.*—John Procopi and H. Rodman Smith, sales manager and assistant sales manager, respectively.

▶ *GARDNER-DENVER CO.*—New vice presidents are George W. Gutekunst, C. H. Rieman, Brice D. Maddox.

▶ *PATCO MFG. CO.*—Frank Walsh, sales manager for company's newly formed gas and electric water heater division.

WHO'S WHAT

Continued

▶ *HOOKER ELECTROCHEMICAL CO.*—Hiram B. Young, vice president; F. Leonard Bryant, vice president, production; Dr. Marion B. Geiger, director, general development.

▶ *COCHRAN FOIL CO., INC.*—C. W. Huflage, vice president in charge of sales; R. D. Vickers, general sales manager; W. R. Cory, sales manager, foil division; J. B. Gage, sales manager, sheet division; J. E. Bouhl, sales manager, laminating division; M. R. Kambach, head of market planning division.

▶ *HAYS CORP.*—John R. Wood, Jr., a director.

▶ *De LAVAL STEAM TURBINE CO.*—Paul S. Nurko, general superintendent of all production shops; Leonard Schwarz, superintendent of main shop; Kenneth Lippincott, superintendent of standard products shops; Milton Hamond, superintendent of "Turbo-charger" shops; Joseph Basso, supervisor of manufacturing research, dealing with special tooling and equipment problems.

▶ *WILLIAM POWELL CO.*—Named vice presidents are George W. Mueller, V. Anderson Coombe, John A. Parlin, Russell G. Smith.

▶ *UNION CARBIDE CHEMICALS CO.*—John R. Hulton, manager of fluorocarbon sales.

▶ *PHILCO CORP.*—Joseph D. Lydon, director of sales development; William T. Quillen, Jr., manager of sales training production; Robert M. Jones, director of public relations; R. J. Doornevelt, appointed to advanced engineering staff, for advanced development work of air conditioning products.

▶ *McQUAY, INC.*—Paul C. Van Alstyne, head of company's new package chimney division.

▶ *CHASE BRASS & COPPER CO.*—George Sengstacken, assistant vice president in charge of operations; Gilbert R. Boutin, works manager, succeeding Mr. Sengstacken.

▶ *BENDIX-WESTINGHOUSE AUTOMATIC AIR BRAKE CO.*—Willard B. Paine, executive vice president; I. F. Richardson, general manager of Kansas City Div. of Bendix Aviation Corp., succeeding Mr. Paine; Eldred E. Evans, assistant to Mr. Richardson.

▶ *CARRIER CORP.*—David F. Forward, assistant sales promotion manager for Allied Products Div.

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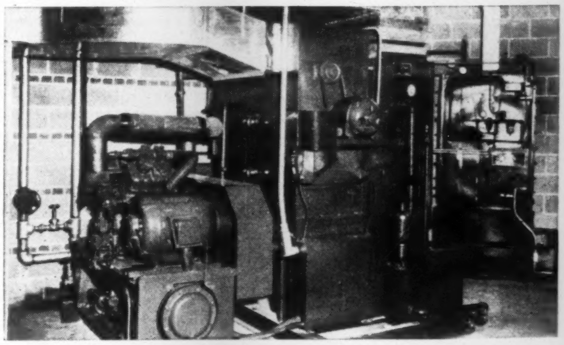
PRECISELY as you want it



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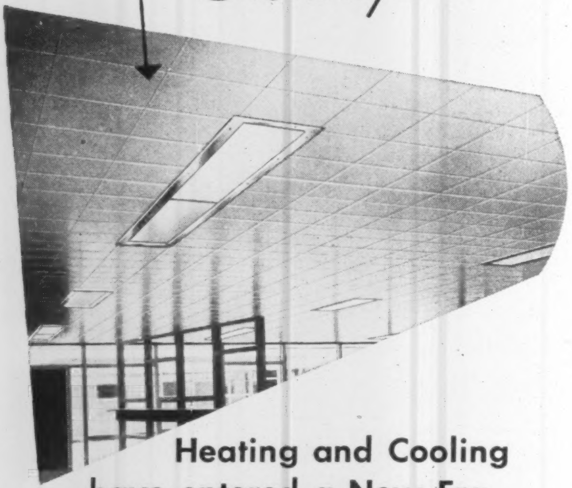

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WHO'S WHAT

Continued

▶ *BETZ DIV., BOHN ALUMINUM & BRASS CORP.*—Ray V. Burdeno, plant manager at Danville, Ill.

▶ *HOFF MFG. CO.*—Robert C. Cottrell, general sales manager.

▶ *BRISTOL CO.*—J. W. Peckham, manager of newly opened branch factory and repair laboratory in Los Angeles.

▶ *JOHN WOOD CO.*—Meredith L. Addy, purchasing agent, Heater & Tank Div.

IN THE TERRITORIES . . .

(Recent sales appointments)

▶ *MINNEAPOLIS-HONEYWELL REGULATOR CO.*—D. H. Hannasch, manager of branch sales office in Charlotte, N.C.

▶ *RAMSET FASTENING SYSTEM, OLIN MATHIESON CHEMICAL CORP.*—Henry G. Walesch, district sales manager for northern Ohio, Pittsburgh, northwestern New York State.

▶ *A. M. BYERS CO.*—Chester W. Leschenko, field service engineer, Pacific Coast Div., to cover Los Angeles area.

▶ *A. W. CASH CO.*—Engineered Instrument Sales Co., representative for Memphis area.

▶ *WORTHINGTON CORP.*—Distribution district managers of new air conditioning and refrigeration sales offices are: R. O. Gundlach, midwest, with headquarters in Chicago; H. A. Cardwell, southeastern, with headquarters in Atlanta; J. A. Klaiber, central, with headquarters in Cleveland; H. Fleit, northeastern, with headquarters in New York; J. S. Cavanaugh, east central, with headquarters in Philadelphia.

▶ *LEWIN-MATHES CO. DIV. OF CERRO DE PASCO CORP.*—Bill Herlihy, Tampa manager; Fred Bratt, rod and tube sales, Detroit office; Al Dennison, manager of brass rod sales, New York office; Dick Lowrey, manager of Dallas office.

▶ *DRAYER-HANSON, DIV. OF NATIONAL-U.S. RADIATOR CORP.*—S. C. McCann Co., representative for western Missouri-Kansas area.

WHO'S WHAT

Continued

▶ *ORR & SEMBOWER, INC.*—New sales representatives for "Powermaster" packaged automatic boilers are: H. M. Kimmey Co., Inc., Albany, N.Y.; Buckpitt & Co., Rochester, N.Y.: Arthur Beningson, Westchester County, N.Y., and western Connecticut; Chippewa Industrial Sales Co., Buffalo; J. A. Harwell, Nashville, Tenn.

▶ *DRAVO CORP.*—Mechanical Equipment Co., distributor for 76-county area in Texas; Vernon S. Tupper Co., distributor for 32 Tennessee counties.

▶ *BURGESS-MANNING CO.*—Nichols and Haertel, Inc., exclusive distributor for "3-Way" radiant panel heating, cooling and acoustical ceiling in Chicago, northern Illinois, eastern Iowa.

▶ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.*—Van D. Clother, Inc., Wolverine's far western agent, has opened new offices and mill depot facilities in San Francisco.

▶ *FLEXONICS CORP.*—George W. Derum, manager of newly formed western regional office at North Hollywood, Calif. The office will be headquarters for sales, service and field engineering in all states west of the Rockies.

▶ *DUNHAM-BUSH, INC.*—R. G. Potter, sales engineer to represent the company in Oregon, Washington.

▶ *YORK CORP.*—Service Parts Co., wholesale distributor for "Hydraline" products in Chicago area.

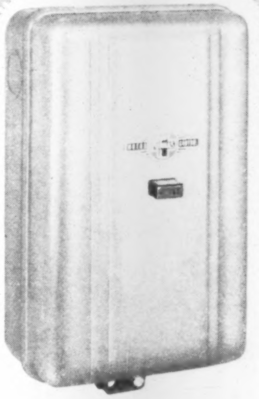
▶ *McQUAY, INC.*—Named representatives for heating and air conditioning products are: Alexander Mitchell Co., central and eastern New York State, Vermont; R. K. Goode Co., New Orleans.

▶ *SPORLAN VALVE CO.*—Joseph R. Nolet, manager of Boston office. Mr. Nolet replaces Thor Gislason, named to engineering staff at company's home office in St. Louis.

▶ *TRANE CO.*—Assigned packaged air conditioner sales engineers are: David E. Washburn, Pittsburgh; Robert J. Doran, Greensboro, N.C.

▶ *OLIN MATHIESON CHEMICAL CORP.*—John C. Spencer, manager of new Olin Aluminum district sales office in Atlanta, which will serve Alabama, Florida, Georgia, the Carolinas, eastern Tennessee; Keith C. Carothers, manager of Miami branch.

SAVE 2 WAYS WITH FURNAS "In Between" STARTER SIZES



LOWER COST—save up to 25% by buying the exact size starter for the job, instead of having to take a standard one that may be too large.

LESS SPACE—save up to 40% by selecting a compact starter of a size designed to fit your requirement.

Furnas offers you 10 Magnetic Starter sizes instead of the usual five—5 standard and 5 "in-between" sizes. The "in-between" sizes allow you to choose the control that is exactly suited for your particular job when a standard size is not quite right. No need to waste money or space on a starter that is too large.

For information on our complete line of air conditioning and refrigeration controls, write for Bulletin 5519. Furnas Electric Company, 1041 McKee Street, Batavia, Ill.

A31

FURNAS 25th YEAR

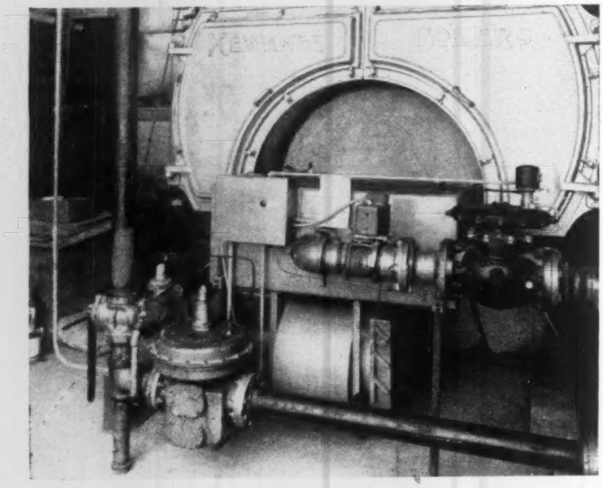
FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

Hot water for 1,000 cabanas

heated at less-than-expected cost by

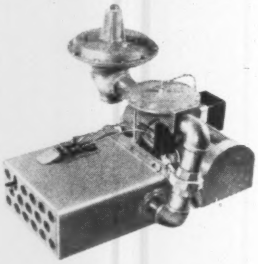
LO-BLAST

POWER GAS BURNER



At beautiful Malibu Beach Club, Lido Beach, Long Island, N. Y., the hot water demand of these cabanas creates an exceptionally heavy load. 1000 showers and the kitchen facilities of two restaurants are amply and economically supplied by a 450 horsepower Scotch Marine boiler, automatically gas-fired by a 20,000,000 BTU-Lo-BLAST Burner. Manufactured gas is furnished by the Long Island Lighting Company, which reports that *operating cost is less than estimated at the time of installation!*

Lo-BLAST Power Burners use an extremely quiet, low-speed blower to provide perfectly controlled primary and secondary air...operation is always independent of natural draft. These burners eliminate the need for high chimneys—inshot design reduces maintenance cost. All units are completely assembled and tested on gas before shipment.



Capacities 75,000 — 20,000,000 BTU/hr. input.

Lo-BLAST Burners average 10% less in operating cost!

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

WHO'S WHAT

Continued

▶ *CARRIER CORP.*—John F. Kooistra, western regional manager for Machinery and Systems Div.; Valley Sheet Metal Co., applied equipment distributor in Phoenix.

▶ *PATTERSON-KELLEY CO., INC.*—George A. Adlam, manager of newly opened Milwaukee branch office.

▶ *RECOLD CORP.*—W. Les Werner, district manager of northern California, Oregon, Washington, western Canada territory; Blake Thomas Co., distributor for Kansas, Missouri, southern Illinois, southern Indiana; Boyd Engineering Co., Inc., distributor for west Texas, New Mexico, part of Mexico.

▶ *CANTON STOKER CORP.*—Martin H. Collins, manager of Canton-Chicago Co., Canton Stoker's new Chicago agency.

▶ *ACME INDUSTRIES, INC.*—Dave Levinson and Walter Brodz, sales engineers for St. Louis area.

▶ *DETROIT STOKER CO.*—N. H. Johnson, manager of Minneapolis district office.

▶ *REMINGTON AIR CONDITIONING DIV., REMINGTON CORP.*—C. W. Lehner, representative for Alabama, Georgia, eastern Tennessee.

▶ *WARNER ELECTRIC BRAKE & CLUTCH CO.*—Samuel Harris & Co., Inc., distributor for company's industrial division in Chicago-Rockford-Waukegan, Ill., area.

▶ *PERFECTION INDUSTRIES, DIV. OF HUPP CORP.*—New district managers are: C. Adrance Montague, air conditioning specialist in Philadelphia, eastern Pennsylvania, New Jersey; Theodore E. Bruch, Iowa, South Dakota; John F. Platz, southern Ohio, western Pennsylvania.

▶ *HEIL CO.*—Excelsior Steel Furnace Co., Chicago area distributor.

▶ *HARCRAFT BRASS, DIV. OF HARVEY MACHINE CO., INC.*—Harry Jaye & Co., Inc., warehousing and sales representative for metropolitan New York, Westchester, and Rockland Counties in New York, northern New Jersey, including Trenton; J. A. Murphy & Co., Inc., a similar appointment for northern Illinois, Iowa, and Lake County, Indiana.

WHO'S WHAT

Continued

▶ *OLIN MATHIESON CHEMICAL CORP.*—For Olin Aluminum Div.: Fred H. Edgar, sales manager, Detroit-Cleveland division; Forrest F. Tiffany, sales manager, Cincinnati-Dallas division.

▶ *MITCHELL MFG. CO., DIV. OF CORY CORP.*—Named distributors for company's room air conditioner line are: Fridley Bros., St. Louis trading area, including eastern Missouri, southern Illinois; Bond-Ridder-Jackson, Charleston, W. Va.

▶ *ROCKWELL MFG. CO.*—Dr. Charles J. Kentler, Jr., and Charles B. Goff, Jr., New York and Pittsburgh district sales managers, respectively, for Meter and Valve Div.; James C. Stoner, district sales manager in Illinois area, Delta Power Tool Div.

▶ *NIAGARA MACHINE & TOOL WORKS*—Satterlee Co., distributor in Minnesota, northwestern Wisconsin.

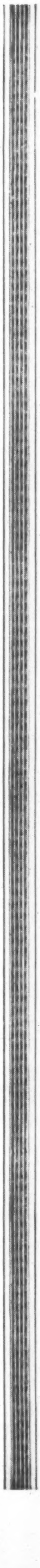
▶ *MORRIS MACHINE WORKS*—Edgar A. Rogers, representative for northern Alabama, Georgia, eastern Tennessee; Roy C. Crumbliss, to cover southern Alabama, southern Georgia.

▶ *AUTOMATIC SWITCH CO.*—Authorized stocking distributors of solenoid valves are: Control Equipment Co., Salt Lake City; Ace Supply Co., San Antonio; Industrial Engineering Equipment Co., Davenport, Ia. Raymond L. Walter has been appointed to the company's sales engineering team covering northern New Jersey, western Connecticut, parts of New York State.

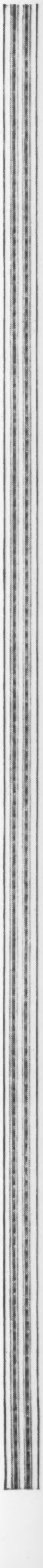
▶ *PAINE CO.*—Chase C. Coffey, southern factory representative. Mr. Coffey will work with Paine representatives in Atlanta, Charlotte, New Orleans, Houston, San Antonio, Dallas.

▶ *RITTLING CORP.*—Recently named sales representatives are: Brownlee-Morrow Engineering Co., Birmingham; Clyde Co., Berkeley, Calif.; L. W. Kelly & Assoc., Greenville, S.C.; Tennity & Co., Inc., Los Angeles; J. H. Ballenger, Cincinnati; Tenaire, Inc., Phoenix; W. H. Welch, Seattle; D. M. Allen Co., Kansas City, Mo.; Midwest Sales Co., St. Louis.

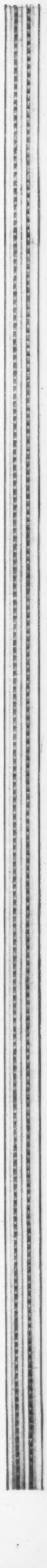
▶ *BALDOR ELECTRIC CO.*—Clarence W. Flaig, district representative for motor division for Louisiana, Mississippi, Alabama, parts of Florida and Tennessee; Edwin H. Gahn, sales engineer for Chicago, northern Illinois, northern Indiana.



Type F



Type S



Type H

Slot STRIPLINE DIFFUSERS by AGITAIR® Slot

STRIPLINE combines the best features of both slots and efficient air diffusers to provide equalized air flow throughout its entire length.

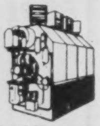
STRIPLINE slot diffusers are slenderly designed, inconspicuous, practical and versatile.

These slot diffusers can be located in walls, ceilings, coves, moulds, window reveals and stools or almost anywhere to suit interior design.

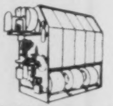
Write for complete Stripline Catalog.

AIR DEVICES INC. • 185 MADISON AVENUE • NEW YORK 16, N. Y. • AIR DIFFUSERS • FILTERS • EXHAUSTERS

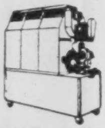
SEND TODAY FOR LATEST HEATER DATA



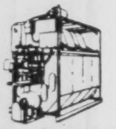
Model H — vertical unit with discharge heads 12 sizes



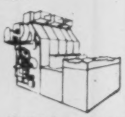
Model D — vertical unit for duct work 12 sizes



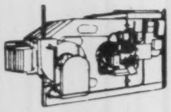
Model P — portable, vertical unit for flexible duty. 6 sizes



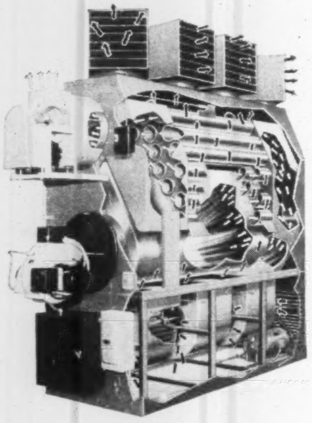
Model R — inverted unit with discharge heads at bottom 12 sizes.



Model S — vertical unit with side blowers to permit proper location of air mixing dampers 12 sizes.



Model C — horizontal ceiling suspension unit for space saving. 12 sizes.



Tempering Make-up Air? Drying? Space Heating?

Let National Heater Company show you how space heating and ventilating problems can be solved **efficiently** and **economically.** No matter how large or small a plant may be, National Champion Heaters **save** money on installation, operation and maintenance.

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6 Models 66 Sizes
400,000 to 2,000,000 BTU's
Automatic Operation
PLUS Year-Round VENTILATING!

Direct-fired for gas, oil and combination fuels. Approved by American Gas Association. Listed by UL

WRITE TODAY FOR A NEW 6-PAGE BROCHURE LISTING SPECIFICATIONS AND DIMENSIONAL DATA OF 1956-57 LINE OF NATIONAL CHAMPION HEATERS

NO OBLIGATION! MAIL THIS COUPON TODAY!

NATIONAL HEATER CO., Inc., 2475 Doswell St., St. Paul 9, Minn.

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We're interested in knowing more about National Heaters as noted below:

☐ Send additional material on the 1956 line.
☐ Have your representative call on us.

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ADDRESS: ______
BY: ______
POSITION: ______

NATIONAL
HEATER CO., INC.
2475 Doswell St., St. Paul 9, Minn.

WHO'S WHAT

Continued

▶ *ALPHA PLASTICS, INC.*—Stocking distributors of PVC pipe, fittings and valves are: Mayer-Malbin, Astoria, L.I., N.Y.; John Wilfert, Inc., Brooklyn; Ward Bros. Mill Supply, Lockport, N.Y.; J. Heller & Sons, Newark; Keenan-Cashman, Bayonne, N.J.; Missouri-Kansas Supply Co., Kansas City, Mo.

▶ *PUROLATOR PRODUCTS, INC.*—Representatives for oil burner and oxidizer filters are: Product and Sales Development Assoc., Ohio, eight counties in Illinois; W. I. Negle Co., West Virginia, parts of Maryland and Pennsylvania; Halberg Co., Manhattan, Queens, Nassau and Suffolk Counties, New York.

▶ *H. N. HARTWELL & SON, INC.*—J. S. McCullough, Jr., exclusive agent in New Jersey, eastern Pennsylvania, Delaware, Maryland, Virginia.

▶ *BORG-WARNER CORP.*—George P. F. Smith has assumed additional responsibility of operating Washington, D.C., office. Mr. Smith is a vice president and eastern representative for Borg-Warner.

▶ *LES TYE CO.*—Wallace R. Hopkins, manager of recently opened Dallas office. Manufacturers represented by Les Tye are Modine Mfg. Co., Davis Engineering Corp., Vulcan Radiator Co., Illinois Engineering Co., McDonnell & Miller, Inc., Thermal Engineering Corp., Sellers Engineering Co., Pacific Pumping Co., Marley Co.

▶ *ANSUL CHEMICAL CO.*—Stanley Clobridge, refrigeration sales representative for southern Texas, Mississippi, Louisiana.

▶ *JOSEPH T. RYERSON & SON, INC.*—James E. Burke, manager of alloy and stainless steel sales at Pittsburgh steel service plant.

▶ *TUBE MANIFOLD CORP.*—C. G. Baker and E. E. Weil, factory representatives for Atlanta, Ga., and Elizabeth, N.J., respectively, for company's molecular sieve filter-driers.

▶ *HOOKER ELECTROCHEMICAL CO.*—George J. Bruyn, manager of New England district sales. Mr. Bruyn is vice president and manager of Marble-Nye Co., a Hooker Subsidiary.

▶ *BLACK & DECKER MFG. CO.*—William W. Adams, manager of new factory service and sales branch in Washington, D.C. The branch will serve adjacent areas of Maryland, Virginia, West Virginia.

▶ *AUTOMATIC SWITCH CO.*—Donald T. Arundel, sales engineer for Manhattan, Brooklyn, Long Island. New stocking distributors of "Asco" solenoid valves are: Evansville Supply Co., Evansville; Lakeland Engineering Equipment Co., Minneapolis; Leinart Engineering Co., Knoxville.

▶ *ELECTRIC FURNACE-MAN, INC.*—Appointed district sales managers are: H. B. Menard, Michigan, Ohio, Wisconsin, Indiana, Illinois; H. Olandt, southeastern Pennsylvania, central and south New Jersey, Delaware.

▶ *TYPHOON AIR CONDITIONING CO., DIV. OF HUPP CORP.*—Peerless Pacific Co., wholesale distributor for Portland, Ore., area.

▶ *BAKER MFG. CO.*—Harold R. Gallatin, factory representative in Kansas, Missouri, neighboring areas.

▶ *OTTO BERNZ CO.*—John A. Van Winkle, eastern regional sales manager.

▶ *F & F MFG. CO.*—Waukesha Sales and Service, Inc., Houston distributor for "FloWay" turbine pump and "Watermaster" pump lines.

▶ *RUBEROID CO.*—Wilbur C. Neel, manager of combined Salt Lake City-Denver sales districts; Carl H. Thede, sales manager of Mobile sales district; Charles D. Peterson, assistant sales manager, Baltimore sales district; Jack Spillman, representative in eastern Oklahoma.

▶ *FULTON SYLPHON DIV., ROBERTSHAW-FULTON CONTROLS CO.*—James D. Crum, sales engineer, Baltimore office.

▶ *JOSEPH T. RYERSON & SON, INC.*—Ronald S. Yale, products sponsor for sheet and strip sales at Milwaukee plant.

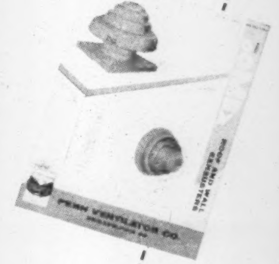
▶ *TRION, INC.*—Representatives for commercial and industrial electronic air cleaning equipment are: Edwards Air Conditioning Sales Co., Cincinnati; Tri-State Equipment Co., Preakness, N.J.

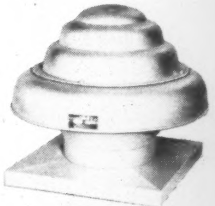
▶ *JOHN WOOD CO.*—Erskine E. Traynham, representative for Heater & Tank Div. in southern Virginia, the Carolinas, east Tennessee.

▶ *WHEELABRATOR CORP.*—L. W. Kohlmeyer, district manager of New York office; George F. Jones, district sales engineer, Chicago office. ⧺

NOW AVAILABLE . . the most complete bulletin on spun-aluminum exhausters!

Penn's new Domex brochure, DMX18, has all the facts about centrifugal roof and wall mounted exhausters, as well as axial flow and relief Domex's. Your FREE COPY is available immediately.





DOMEX ROOF EXHAUSTER

More than 60 certified performance tabulations for both direct and V-belt driven roof exhausters are available throughout the range of sizes, and are published in this new brochure. Reliable ratings backed by PFMA certification.

Certified Ratings
PFMA

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More than 12 certified performance tabulations are listed for this newly restyled fan. Its engineered design makes it completely weatherproof. Includes expanding discharge areas.

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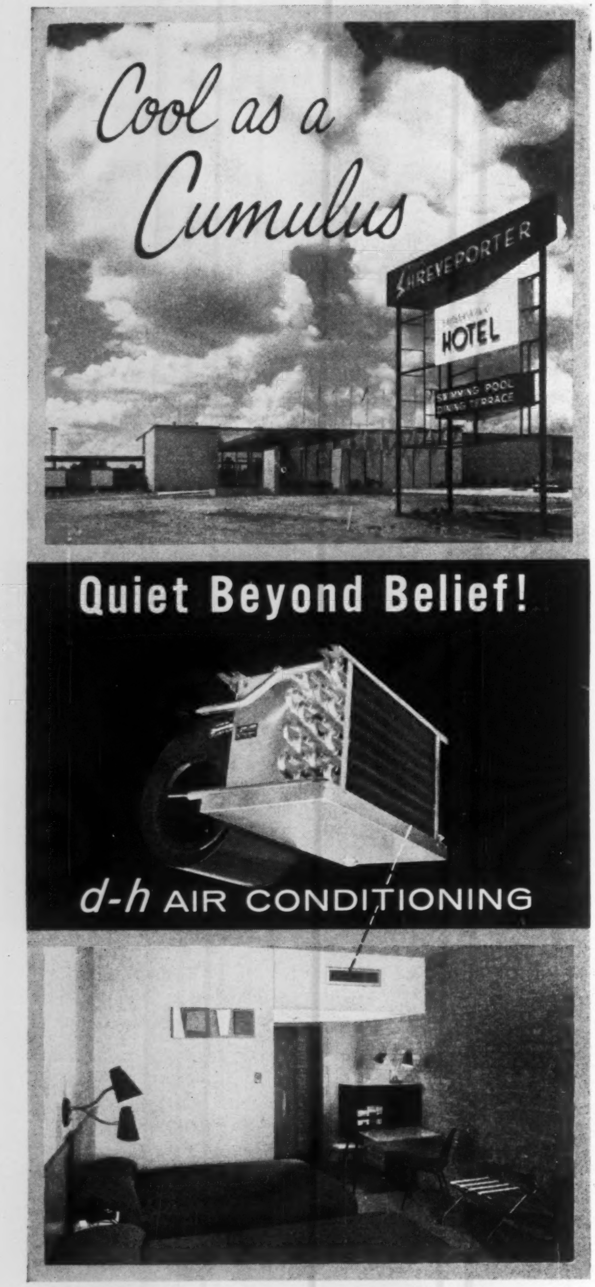

Says: Jack Tullos, President-Manager of the eye-filling new Shreveporter Highway Hotel . . .

- "Quite a saving in initial and operating costs!"
- "Periodic filter change our only maintenance."

Drayer-Hanson can cite similar case histories, world-wide: big jobs or small; new or old construction; residential, commercial, industrial . . .

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DIVISION OF NATIONAL-U.S. RADIATOR CORP.
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CABLE FORTRADE

WE HEAR THAT . . .

▶ *CERRO DE PASCO CORP.* has acquired the assets and business of *LEWIN-MATHES CO.* The acquisition was made in an exchange of stock. Lewin-Mathes will function as a division under the name *LEWIN-MATHES CO. DIV. OF CERRO DE PASCO CORP.*

▶ *PERRY H. ZIEL* has announced the formation of *P. H. ZIEL & ASSOC.*, consulting engineers. The Cincinnati firm performs building functions of heating, ventilating, air conditioning, refrigeration and electrical work and specializes in high temperature hot water heating, according to Mr. Ziel.

▶ *CARNES CORP.* and *W. R. CARNES CO., INC.* have been sold to *DINGS MAGNETIC SEPARATOR CO.* The successor company will be known as Carnes Corp. and will operate as a wholly owned subsidiary.

▶ A new company, *AMPERE INDUSTRIES*, has been established in Newark, N. J., to manufacture electric radiant heating equipment for commercial and industrial applications. Its line will consist of three baseboards, a portable and a ceiling heat-light unit. The equipment utilizes a new development know as the "Amp-Quartz" element, according to the company.

▶ *ILLINOIS IRON & BOLT CO.* has purchased the Burdett "Radi-Heat" Gas Burner Div. of *BURDETT MFG. CO.* All tools, dies, equipment and inventory have been moved to the Carpentersville, Ill., plant of Illinois Iron & Bolt.

▶ *RALPH S. JESSUP*, a National Bureau of Standards authority in the field of heat standards, has been awarded the Department of Commerce Gold Medal for Exceptional Service, the department's highest honor. The award recognizes his "perfection of combustion calorimetry and development of the benzoic acid standard and the extension of precise laboratory techniques to measurements in difficult fields of fluorine reactions and solutions."

▶ *GERSHON MECKLER* has announced the formation of *MECKLER ENGINEERING CO.* Mr. Meckler opened consulting engineering practice in July at offices at 713 Phillips Ave., Toledo. The firm specializes in mechanical services related to buildings, process air conditioning, refrigeration, heat transfer, industrial piping and boiler plant design.

▶ *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.'s* 16th Diamond Key Award was presented this year to *JAMES L. THRELKELD*, profes-

WE HEAR THAT

Continued

sor of mechanical engineering, University of Minnesota, and *DR. TAMAMI KUSUDA*, staff engineer, *WORTHINGTON CORP.* The award was given for their paper, *Temperature Changes in Refrigerated Rooms During Pulldown Period.*

▶ *TRANE CO.* plans to further expand its research and testing center. When complete the facility will be double the size of the original building constructed in 1953, the company says. Cost of the program is about $700,000 and involves 35,000 sq ft of test area.

▶ *AIR REDUCTION CO., INC.* plans a $3 million expansion at Lorain, Ohio, that will more than double its production facilities for gaseous and liquid oxygen. Construction of the addition to the Lorain plant is expected to be underway this month, and will take about a year to complete. It is part of the company's $24 million general expansion program for 1957.

▶ *POWERS REGULATOR CO.* has opened enlarged Minneapolis branch offices at 344 Taft St., N.E. The new 4000 sq ft quarters are twice as large as the firm's previous office. Powers has also opened a new $300,000 Chicago office-warehouse building at 6655 Ridge Blvd. The 16,000 sq ft structure has 7000 sq ft of air conditioned office space.

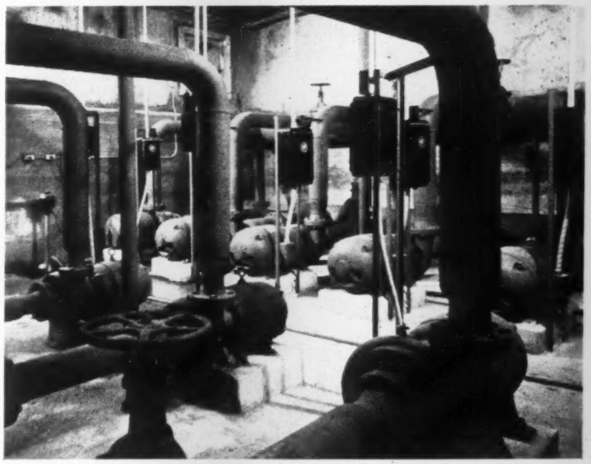
▶ A school, consisting of a demonstration unit which the plastic division of *B. F. GOODRICH INDUSTRIAL PRODUCTS CO.* is sending on a 15 month tour, is designed to teach plant engineers across the nation the techniques of fabricating and installing rigid vinyl pipe and sheeting. Purpose of the tour is to explain the properties of Goodrich's rigid "Koroseal."

▶ *DRAVO CORP.* has formally dedicated its new half million dollar research center on Neville Island, adjacent to the company's main plant in Pittsburgh. The T-shaped structure houses centralized facilities for Dravo's research and development department.

▶ Executive offices of *ROBERTSHAW-FULTON CONTROLS CO.*, now at Greensburg, Pa., will be relocated in early fall to Richmond, Va.

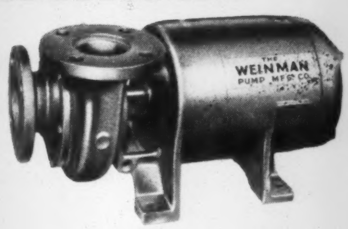
▶ *REVCOR, INC.* has added 18,000 sq ft of manufacturing space to its present plant at Carpentersville, Ill. The expansion is said to double Revcor's manufacturing facilities and will house engineering offices, research and testing facilities as well as production line equipment.

Solve ANY circulation problem more efficiently



WEINMAN

Centrifugal Unipumps



Recirculation systems for heating, air conditioning or any other general pumping requirement can be solved more efficiently . . . more economically with Weinman Unipumps.

These versatile units are designed to conserve space and deliver top pumping performance when mounted in any position. This saves on piping time and materials . . . simplifies installations in limited space.

A specially designed seal in Weinman Unipumps prevents leakage usually caused by abrasive action of dust laden liquids. This assures long life . . . trouble free service.

It will pay you to investigate the complete range of Weinman Unipumps. Output ratings up to 1700 g.p.m. and heads to 260 ft. Send for Bulletin No. 300 and performance curves on all models.

Contact your nearest Weinman Pump Specialist for immediate service on any pumping problem . . . he's listed in the Yellow Pages of your directory.

Find your nearest representative in the 'Yellow Pages'

THE **WEINMAN PUMP** MFG CO
290 SPRUCE ST. COLUMBUS 8, OHIO

there's a...

WALKER DRAFT CONTROL

for Every Heating Purpose

WALKER FUEL-SAVER
AUTOMATIC DRAFT REGULATOR
PATENT NO. 1809005
WALKER MFG. & SALES CORP. ST. JOSEPH MISSOURI

OVER 25,000,000 NOW IN USE

WALKER
Shur-Flo
DRAFT INDUCER

Saves YOU MONEY! *Saves* TIME!
COMBINES 2 DRAFT JOBS IN 1!

Eliminates need for two installations by combining fan operated draft inducer with draft regulator control. Simple to install at any angle.

FAMOUS DRAFT CONTROLS BY WALKER PRECISION ENGINEERED FOR QUALITY

TYPE Z
Dial and Pointer adjustment—simplest design, easiest to adjust, maintains positive and accurate control under widest variation of stack draft.

TYPE 34B
Universally accepted for space heaters, water heaters, trailer stoves, and all budget-priced heating equipment

TYPE BB
Extra rugged, heavy construction designed for commercial and industrial use. Actual installation proved it cut fuel costs in only three months, enough to more than pay total original investment cost.

ROYAL PURPLE MODEL
Walker's finest quality automatic draft regulator with all moving parts completely shielded from corrosion. Guaranteed performance.

WALKER BBG DOUBLE SWING CONTROL
Walker's BBG Double Swing Control regulates updraft, dissipates downdraft in gas-fired and combination oil-gas fired equipment.

VENTURI TOP FOR CHIMNEY CAPS
Unique Venturi design assures positive elimination of downdraft at chimney top . . . for oil, gas or coal fired chimney vents. Patented pivots, balanced construction, guarantee maintenance-free long life.

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☐ Double Swing Draft Control for Gas.
☐ Walker SHUR-FLO Draft Inducer.
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☐ Venturi Top Chimney Cap.

NAME ________________
ADDRESS ________________
CITY __________ STATF ____

WE HEAR THAT

Continued

▶ *FLEXONICS CORP.* plans to build a new plant at Santa Ana, Calif. Construction is expected to begin shortly on an initial building of 25,000 sq ft.

▶ Expansion of unit heater production is reported by *CARRIER CORP.* A new production line already is in operation at the company's Syracuse plant. The facilities include a press shop, metal cleaning and rust-proofing equipment, paint spray booths and ovens.

▶ Increased manufacturing facilities have been announced by *SLANT-FIN RADIATOR CORP.* as a result of securing an adjacent building at Richmond Hill, N.Y.

▶ General offices of *G. S. ZIEGLER & CO.* are now located in the company's own new building in Great Neck, N. Y. The one-story structure contains over 10,000 sq ft of air conditioned space.

▶ An extensive expansion program has been completed by *HARCRAFT BRASS* at its Torrance, Calif., plant. New facilities include electronic heavy duty plating equipment, an analytical control laboratory, and increased warehouse space.

▶ *WELLER ELECTRIC CORP.* will centralize all production, sales and administrative operations at its present general offices in Easton, Pa. New facilities will be erected later this year to quadruple the space of the present 12,000 sq ft building there, the company reports. An additional 40,000 sq ft will be added to house general offices, sales headquarters, manufacturing, engineering, research and design operations.

▶ An automated small motor plant was recently put into production by *WESTINGHOUSE ELECTRIC CORP.* at Upper Sandusky, Ohio. The one-story 66,000 sq ft plant is designed to produce fractional horsepower motors in shaded pole and permanent split capacitor types in about 30 different styles and sizes.

▶ *BURNS AND ROE, INC.*, engineers and constructors, New York, has opened a new office in Seattle.

▶ *DRESSER MFG. DIV., DRESSER INDUSTRIES, INC.* has completed a $1 million compression fitting plant in Wellsboro, Pa.

▶ *HARRY TERRY AND ASSOC.*, consulting engineers, has moved to new offices at 156 W. State St., Trenton, N.J. ‡

MEETINGS & CONVENTIONS

1957

AUG. 11-15—*First National Conference on Applied Heat Transfer.* Pennsylvania State University, University Park, Pa. Sponsored by heat transfer division and central Pennsylvania section of American Society of Mechanical Engineers in cooperation with College of Engineering and Architecture of the University. ASME headquarters: 29 W. 39th St., New York 18.

AUG. 26-28—*Gas Dynamics Symposium.* Technological Institute, Northwestern University, Evanston, Ill. Information: Dr. Ali Bulent Cambel, Gas Dynamics Laboratory, Northwestern University, Evanston, Ill.

SEPT. 9-13—*12th Annual Instrument Automation Conference and Exhibit.* Cleveland Auditorium, Cleveland. Sponsored by Instrument Society of America, 313 Sixth Ave., Pittsburgh 22. Exhibit information: Fred J. Tabery, 3443 S. Hill St., Los Angeles.

SEPT. 13-14—*Associated Insulation Contractors of the Western States,* 16th annual meeting. El Coronado Hotel, San Diego. Information: Insulation Distributor-Contractors National Association, Inc., 1632 K St., N. W., Washington, D. C.

SEPT. 17-20—*Insulation Distributor-Contractors National Association, Inc.,* second annual convention. St. Francis Hotel, San Francisco. Information: IDCNA, 1632 K St., N. W., Washington, D. C.

OCT. 1-4—*National Association of Corrosion Engineers,* north central regional meeting. Chicago. NACE headquarters: 1061 M & M Bldg., Houston 2.

OCT. 1-4—*National Association of Corrosion Engineers,* south central regional meeting. Oklahoma City. NACE headquarters: 1061 M & M Bldg., Houston 2.

OCT. 6-8—*Fluid Controls Institute.* Westchester Country Club, Rye, N. Y. Information: Fluid Controls Institute, Inc., P. O. Box 191, Decatur, Ill.

OCT. 7-9—*American Gas Association,* annual convention. Kiel Auditorium, St. Louis. AGA headquarters: 420 Lexington Ave., New York 17.

OCT. 7-9—*National Electronics Conference.* Hotel Sherman, Chicago. Information: National Electronics Conference, 84 E. Randolph St., Chicago 1.

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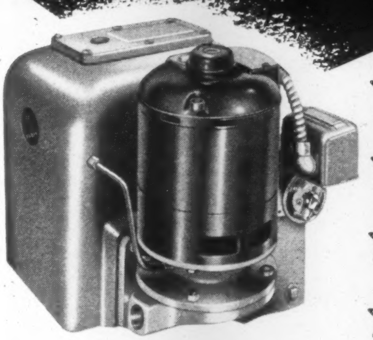

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MEETINGS & CONVENTIONS *Continued*

1957

OCT. 10-11—*Eighth Annual National Noise Abatement Symposium.* Hotel Sherman, Chicago. Information: J. J. Kowal, conference secretary, Armour Research Foundation, 10 W. 35th St., Chicago 16.

OCT. 21-25—*45th National Safety Congress & Exposition.* Conrad Hilton Hotel, Chicago. National Safety Council, 425 N. Michigan Ave., Chicago 11.

OCT. 22-24—*National Association of Corrosion Engineers,* seventh annual western regional conference. San Diego. Information: NACE, 1061 M & M Bldg., Houston 2.

OCT. 30-31—*Industrial Hygiene Foundation,* 22nd annual meeting. Mellon Institute, Pittsburgh. Information: Mellon Institute, 4400 Fifth Ave., Pittsburgh 13.

OCT. 31-*NOV.* 2—*Western Society of Engineers,* national conference. Edgewater Beach Hotel, Chicago. Sponsored by Engineers Joint Council, Scientific Manpower Commission, National Science Foundation and National Academy of Sciences—National Research Council. Information: Engineers Joint Council, 29 W. 39th St., New York 18.

NOV. 12-14—*National Association of Corrosion Engineers,* northeast regional meeting. Pittsburgh. NACE headquarters: 1061 M & M Bldg., Houston 2.

NOV. 13-14—*Air Pollution Conference.* Chicago. Cosponsored by Armour Research Foundation and Midwestern Air Pollution Prevention Association. Information: Conference secretary, Armour Research Foundation, 10 W. 35th St., Chicago 16.

NOV. 14-16—*American Society of Refrigerating Engineers,* semi-annual meeting. Chicago. ASRE headquarters: 234 Fifth Ave., New York.

NOV. 16-18—*Refrigeration and Air Conditioning Contractors National Association,* annual convention. Drake Hotel, Chicago. The association is at 10660 Carnegie Ave., Cleveland 6.

NOV. 16-18—*Air-Conditioning and Refrigeration Wholesalers,* annual meeting. Sheraton Hotel, Chicago. Information: 2607 N. High St., Columbus, Ohio.

NOV. 18-21—*10th Exposition of the Air-Conditioning and Refrigeration Industry.* International

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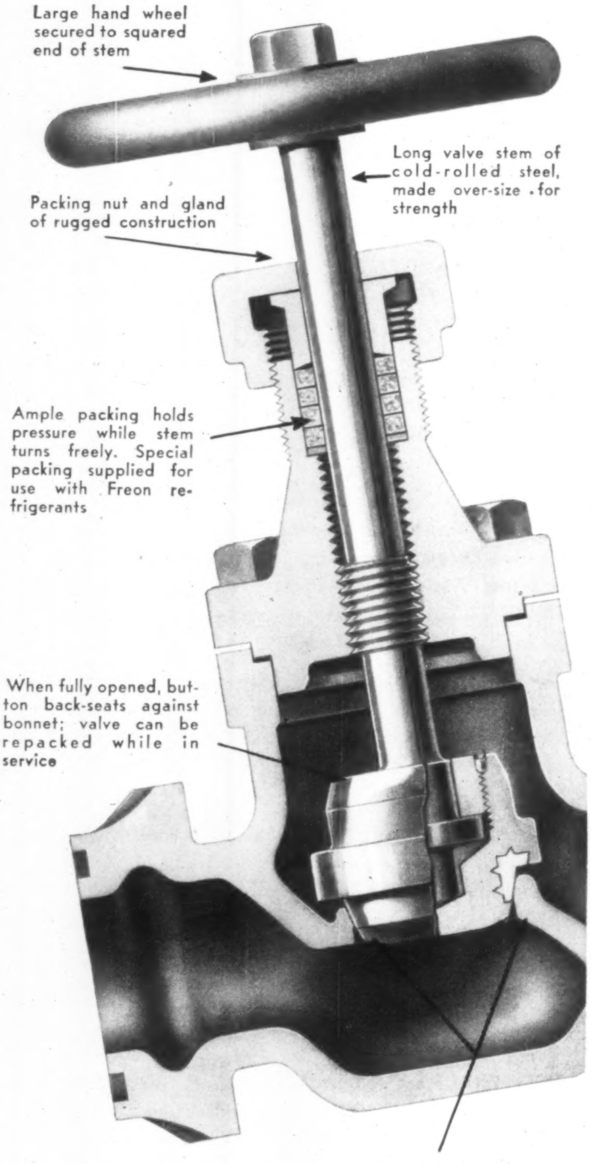
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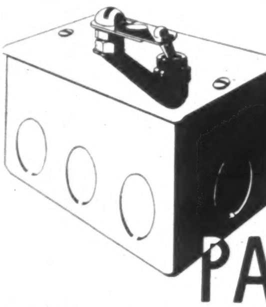

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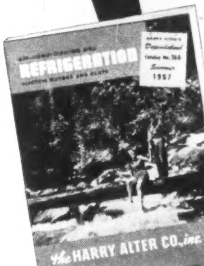

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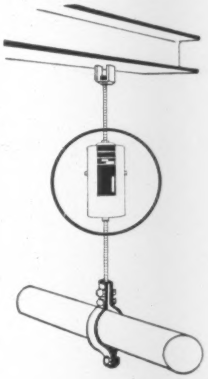

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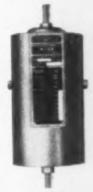

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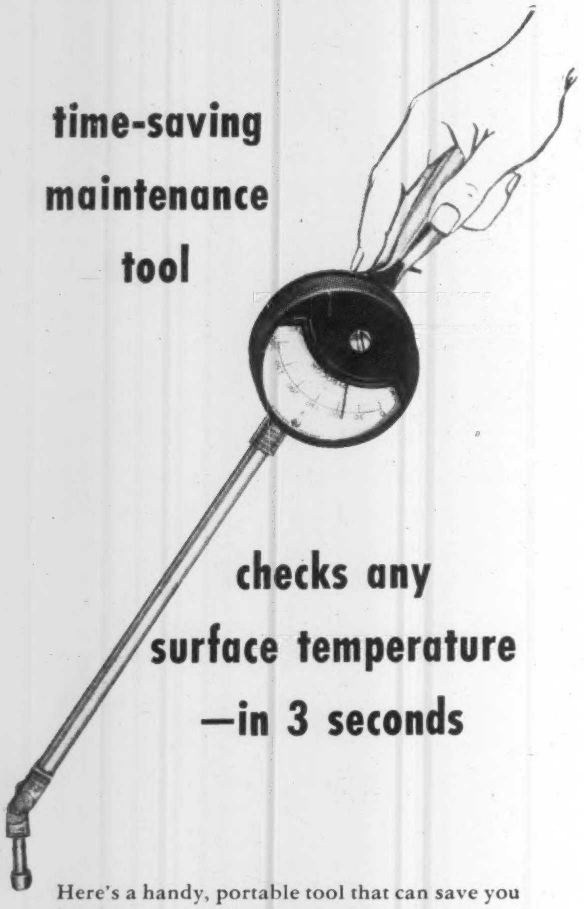

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MEETINGS & CONVENTIONS

Continued

1957

Amphitheater, Chicago. Air-Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C.

NOV. 19-22—*National Warm Air Heating and Air Conditioning Association*, committee meetings and annual convention. Morrison Hotel, Chicago. NWAHACA headquarters: 640 Engineers Bldg., Cleveland 14.

DEC. 4-5—*Third Annual National Construction Industry Conference*. Congress Hotel, Chicago. Information: J. J. Kowal, conference secretary, Armour Research Foundation, 10 W. 35th St., Chicago 16.

1958

JAN. 27-29—*American Society of Heating and Air-Conditioning Engineers, Inc.*, 64th annual meeting. Pittsburgh. Information: A. V. Hutchinson, executive secretary, ASHAE, 62 Worth St., New York 13.

JAN. 27-30—1958 *Plant Maintenance and Engineering Show*. International Amphitheater, Chicago. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

FEB. 3-4—*Instrument Society of America*, national conference on progress and trends in chemical and petroleum instrumentation. Wilmington, Del. ISA headquarters: 313 Sixth Ave., Pittsburgh 22.

FEB. 17-20—*Seventh Annual Industrial Ventilation Conference*. Kellogg Center, Michigan State University, East Lansing, Mich. Information: Industrial Ventilation Conference, Continuing Education Service, Michigan State University, East Lansing, Mich.

MARCH 17-21—*National Association of Corrosion Engineers*, annual conference and exposition. Civic Auditorium, San Francisco. NACE headquarters: 1061 M & M Bldg., Houston 2.

MARCH 31-*APRIL* 2—*Gas Appliance Manufacturer's Association*, annual meeting. The Greenbrier, White Sulphur Springs, W. Va. GAMA headquarters: 60 E. 42nd St., New York 17.

MAY 4-7—*Air-Conditioning and Refrigeration Institute*, annual meeting. The Homestead, Hot Springs, Va. ARI headquarters: 1346 Connecticut Ave., N. W., Washington 6, D. C.

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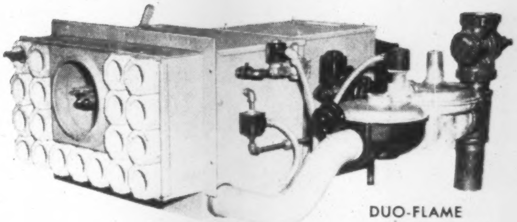

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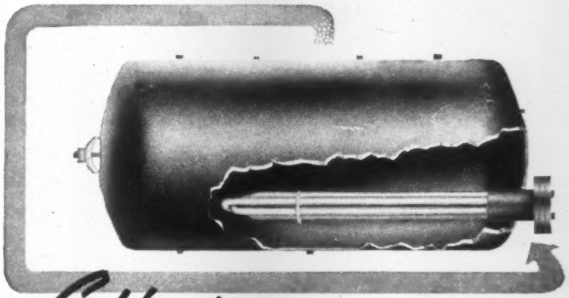

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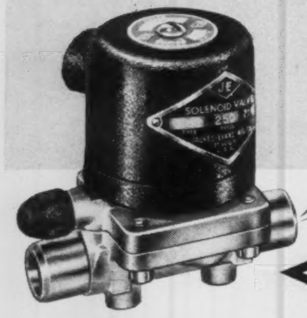

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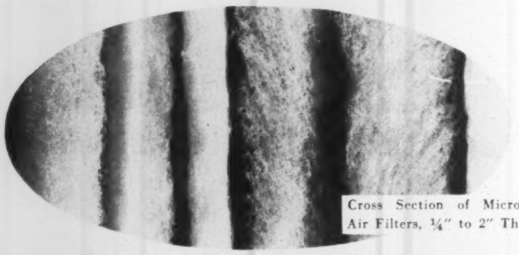

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MEETINGS & CONVENTIONS

Continued

1958

MAY 7-11—*Western Air Conditioning, Heating, Ventilating and Refrigeration Exhibit and Conference.* Shrine Exposition Hall, Los Angeles. Sponsored by Western Air Conditioning Industries Association. Information: Fred J. Tabery, exhibit manager, 3443 S. Hill St., Los Angeles 7.

MAY 11-14—*Fluid Controls Institute.* Lake Placid Club, Lake Placid, N. Y. Information: Fluid Controls Institute, Inc., P. O. Box 191, Decatur, Ill.

MAY 19-23—*National Fire Protection Association,* annual meeting. Palmer House, Chicago. The association is at 60 Batterymarch St., Boston.

JUNE 14-16—*American Society for Testing Materials.* Hotel Statler, Boston. ASTM headquarters: 1916 Race St., Philadelphia 3.

JUNE 23-25—*American Society of Heating and Air-Conditioning Engineers, Inc.* and *American Society of Refrigerating Engineers,* joint meeting. Hotel Leamington, Minneapolis. ASHAE headquarters: 62 Worth St., New York 13. ASRE headquarters: 234 Fifth Ave., New York 1. ⌗

Obituary

Irving W. Reynolds

Irving W. Reynolds, 77, vice president of Foxboro Co., died June 3 of a heart attack. One of the first to join the firm, Mr. Reynolds came to Foxboro in 1908, the year the company was founded. He specialized in the production of instruments and, as factory manager, perfected techniques of manufacturing process instrumentation developed by Foxboro. ⌗

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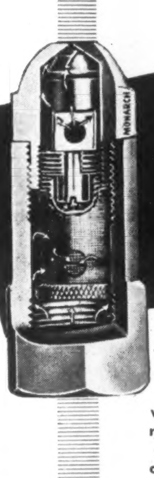

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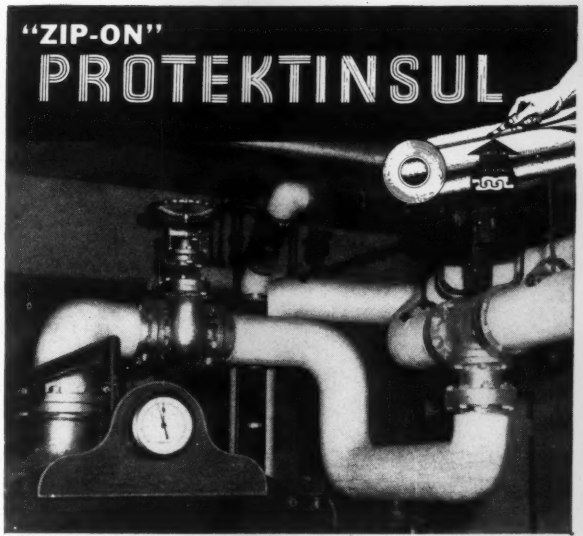

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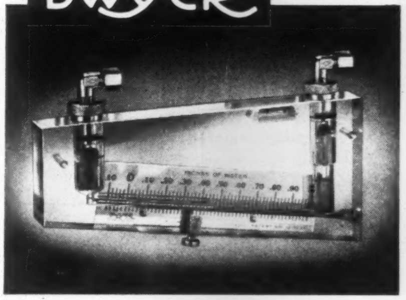

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Hazardous Vapors and Dusts in Industry—By B. H. Jennings, formerly of Northwestern University. Ventilating & Air Conditioning Contractors Association of Chicago, 228 N. LaSalle St., Chicago.

Heat and Thermodynamics—Fourth Ed. By Mark W. Zemansky. 484 pp. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. $7.50.

Transactions of the 21st Annual Meeting of Industrial Hygiene Foundation—281 pp. Industrial Hygiene Foundation of America, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13. $5.00.

Tentative Specification for Brazing Filler Metal—ASTM designation: B 260-56 T. AWS designation: A 5.8-56 T. Copies available from either American Welding Society, 33 W. 39th St., New York 18, or American Society for Testing Materials, 1916 Race St., Philadelphia 3. 40c.

Technical Data on Plastics—224 pp. Manufacturing Chemists' Association, 1625 Eye St., N. W., Washington, D. C. $3.25.

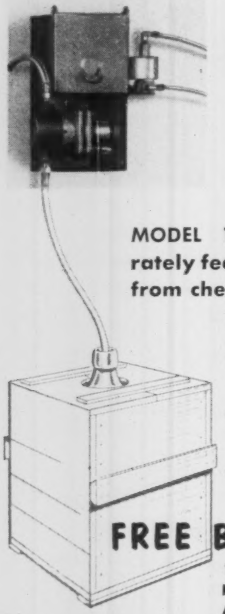
Manual of Mathematics—Lefax Publishers, Ninth and Sansom Sts., Philadelphia 7. $4.25.

Dimensions and Tolerances for Solvent Welded (SWP Size) Cellulose Acetate Butyrate Pipe—Commercial standard CS 206-57. Superintendent of Documents, Government Printing Office, U.S. Department of Commerce, Washington 25, D.C. 5c.

Handbook of Chemical Tables—Lefax Publishers, Ninth and Sansom Sts., Philadelphia 7. $4.00.

Recommended Safety Practices for the Protection of Workers in Foundries—American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. $4.00 ($2.00 to AFS members).

Mathematical Tables—Lefax Publishers, Ninth and Sansom Sts., Philadelphia 7. $3.25. ≠



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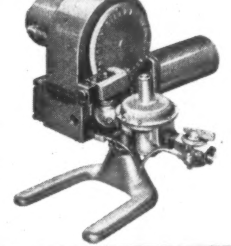

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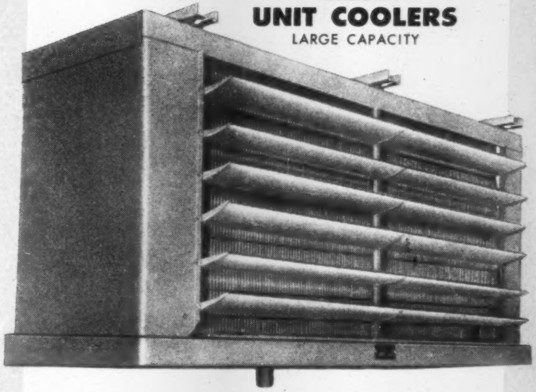

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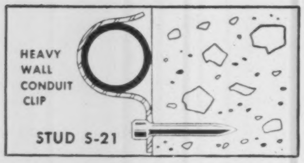

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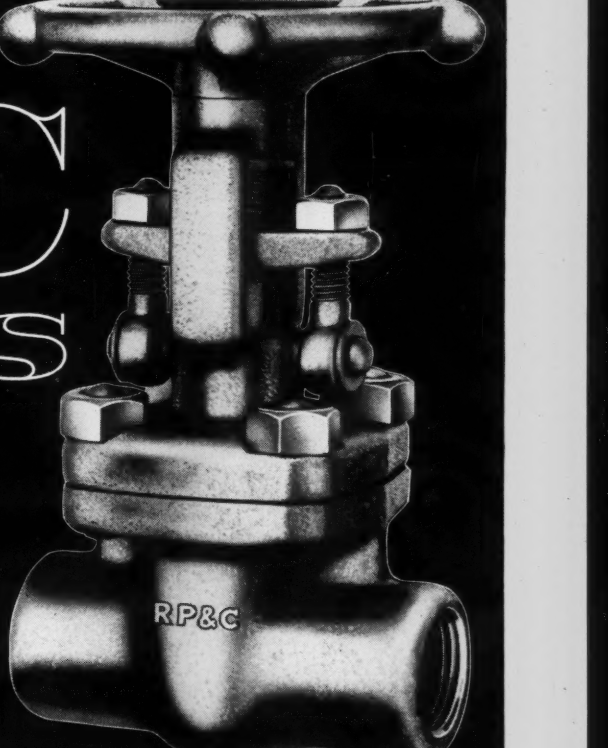

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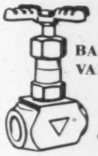
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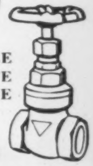
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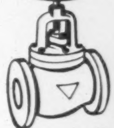
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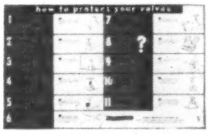

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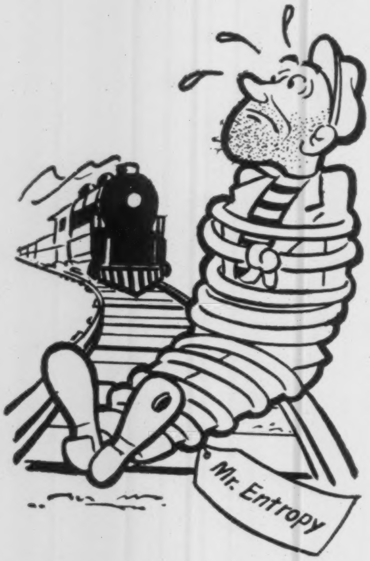

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SELECTOTHERM
HEATING CONTROL SYSTEM ®

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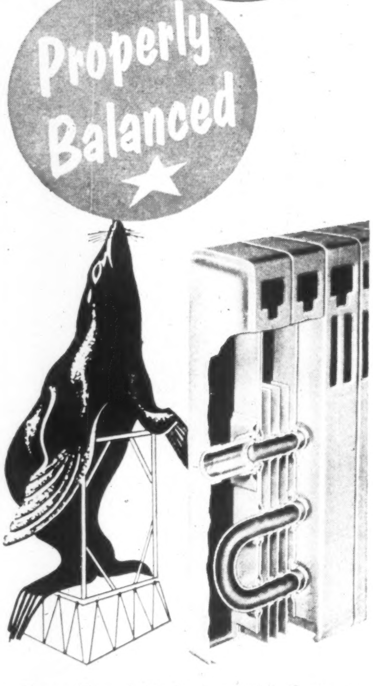
ONLY SHAW radiators

deliver radiant and convected heat



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Shaw's health-guarding proportions of radiant and convected heat will not vary regardless of hot water or steam temperature. There is no stratification—heat is distributed evenly throughout the room.

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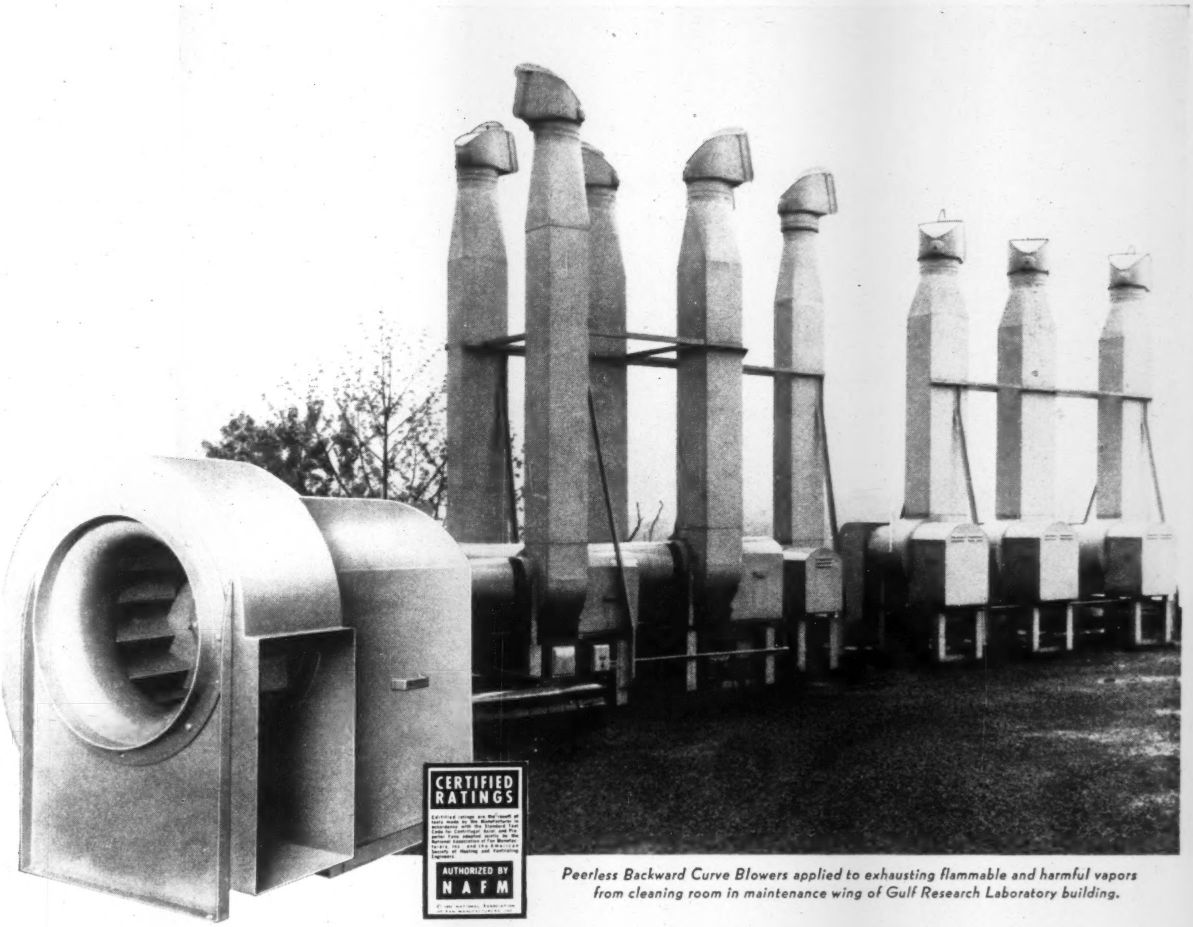

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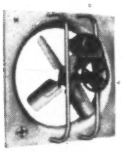
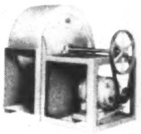
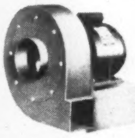
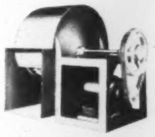
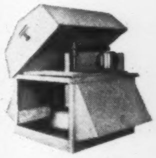

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EXPANSION
in heating systems . . .

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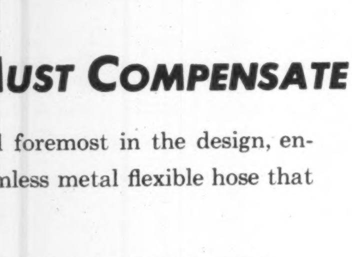

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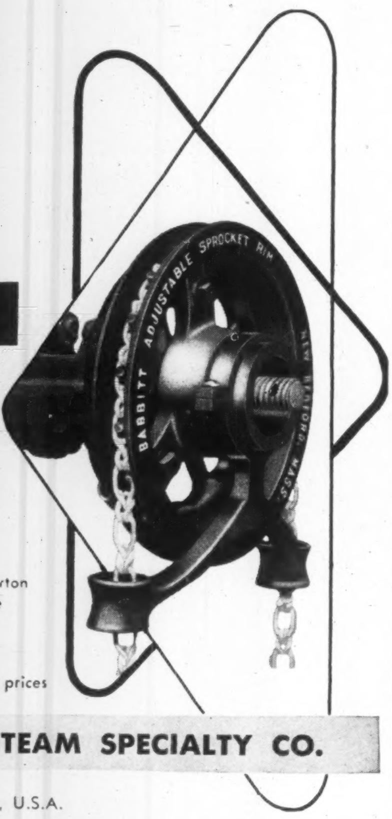

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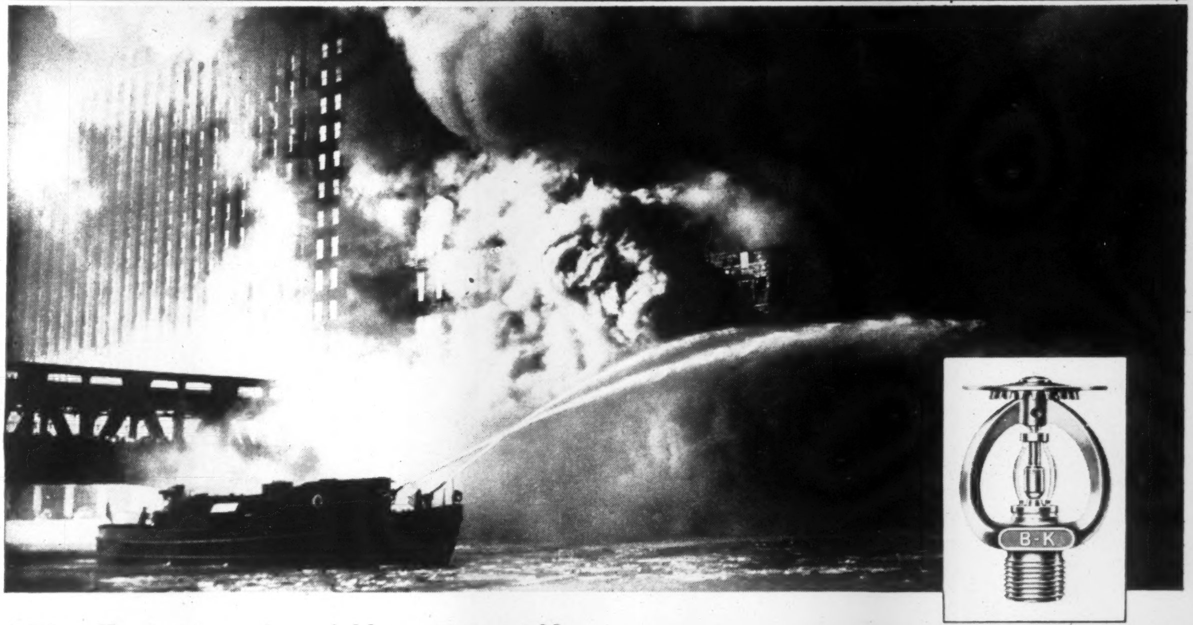

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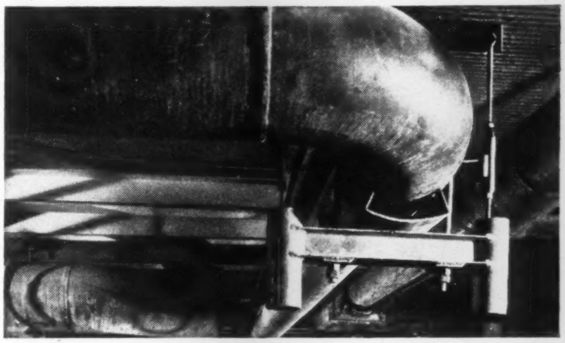

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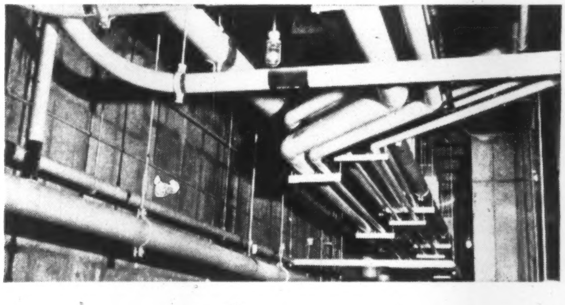

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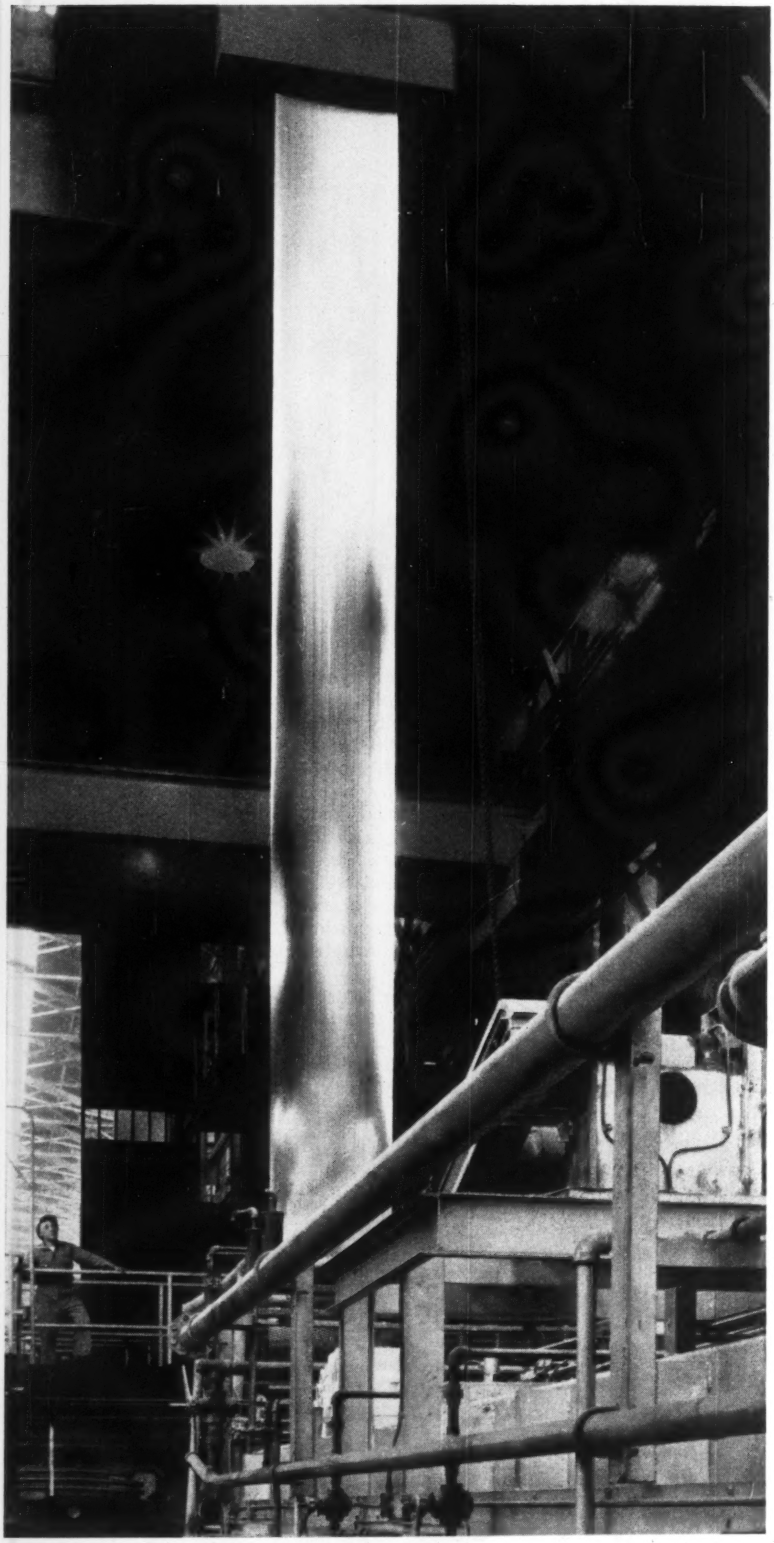

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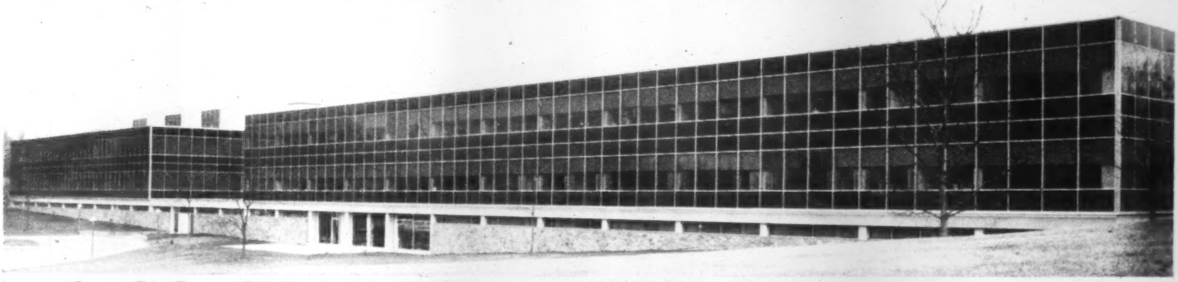
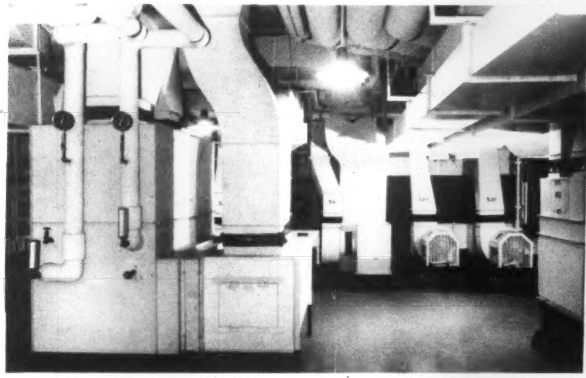
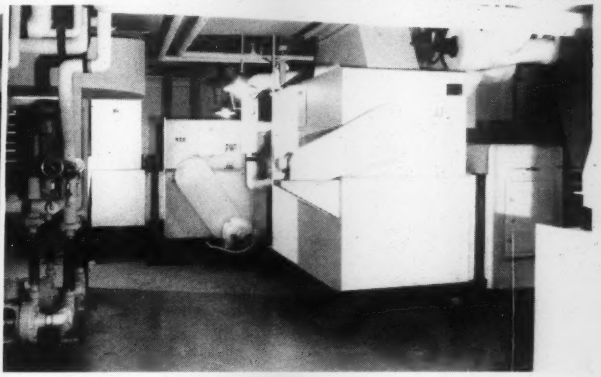




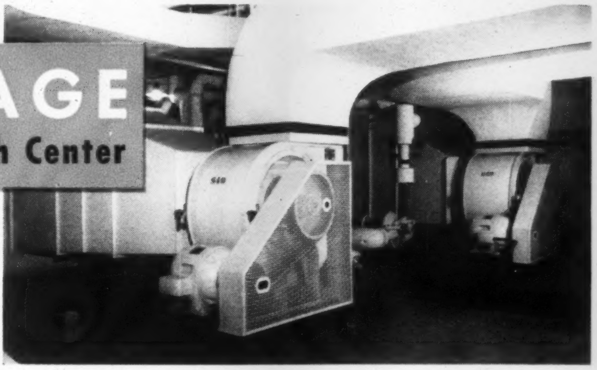
On left, Clarage Multitherm supplying conditioned air to the electrophoresis balance room. Exhaust fans in background.



In foreground, Multitherm supplying make-up air exhausted by laboratory hoods.

AIR via CLARAGE

in Wyeth's new Office and Research Center



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